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VIEWS, NEWS AND INTERVIEWS.

Electricity as a means of increasing the destructive capacity of the various naval forces of the world has come to be such an important factor that people are apt to lose sight of its equally great capacity as a means of defense. The latest development in this direction is called the hydrophone. It is the invention of Captain McEvoy, of the British navy. Its object is to signal to a vessel or land fortification the approach under cover of darkness of any hostile foe. The mechanical arrangement of the apparatus, of which we have spoken before, is as follows: An exceedingly sensitive spring is arranged within a case, so adjusted that the slightest jar or vibration will cause it to move. Attached to the end of the spring is a piece of platinum wire, which, acting in concert with the movements of the spring, will, when a current is passed through it and a telephone receiver placed in the circuit, cause a distinct crackling sound to be heard in the receiver. The instrument for use is anchored several miles from shore and connected to the latter by electric circuit. The mere presence of an ocean-going steamship will create an intense crackling sound, and by an ingenious contrivance will also set in automatic motion an electric bell and an electric lamp. With such a protecting apparatus it will be hereafter practically impossible to use torpedoes or to employ strategic means of approach with any degree of efficiency.

Nearly 91 per cent. of the vessels using the Suez Canal last year were able to pursue their journeys uninterruptedly at night by using the electric light, the percentage in the three preceding years having been 88.21, 83.56 and 71.74, respectively. The authorities of the canal will make it obligatory for vessels passing through the canal by night, after the first of next October, to employ apparatus for dividing the light of the projector into two divergent rays. Approaching vessels may, by this means, travel right up to each other without their respective helmsmen being blinded. The diverging apparatus which is to be used is the invention of one of the agents of the company.

A method of treating patients by placing them in a large spiral of wire charged with alternating currents has been described to the Paris Academy of Sciences by M. D'Arsonval. When the coil is charged with rapid alternations, the induced currents produced in the patient's body are shown by placing a glow-lamp between his hands when the filament is raised to incandescence. The influence of this treatment on the processes of nutrition is said to be good, the absorption and elimination of oxygen being largely increased.

Warden Thayer, of Dannemora Prison, was in attendance at the meeting of prison wardens at Albany last week. He called attention to the bungling execution of Taylor at Auburn, and said that he would be badly off in the event of a similar accident, as there was no public electric plant near him. He was authorized to have constructed a full electric plant before the execution of Murderer Foy, of Saratoga, during the week beginning August 27. This will give him an additional dynamo to be used in case of mishap. Additional evidence of the many uncertainties attending electrocution.

It is estimated that the duplex and quadruplex systems of telegraphy begun by Mr. Edison in 1869, and finished after six years of work, have saved, in this country alone, the enormous sum of $15,000,000.

The European manufacturers of electrical apparatus are not as wide-awake as their American brethren in the business. A short time ago the municipal authorities of the small Spanish town of Olot advertised for bids for the concession for lighting the town, and did not receive a single tender. A Belgium town advertised for tenders for lighting either by gas or electricity, and not one firm responded.

A Western designer of advertising specialties has recently found several ways to make use of the electric light. In several Chicago saloons are incandescent lamps in the form of beer bottles of the ordinary pint size, but of clear glass, with the brewer's label pasted on the outside. In cigar stores are cigar-shaped lamps with the names of cigar manufacturers on the labels encircling them. The grocery stores have lamps made in imitation of cakes of soap, catsup bottles, etc.

Among the most interesting experiments shown at the recent soirées of the Royal Society were those of Sir D. Salomons and Mr. Pike, and these being continued in the laboratory show that two vacuum tubes have a strong attraction for one another, whether they touch along their whole length or only at the ends—one of the tubes being of the shape of a dumb bell, for instance. The experimenters find that a spiral vacuum tube sucks in a "core" tube as a solenoid does an iron core, and the more the "core" is drawn in, the less luminous the "core" tube appears, the core tube not being connected to the circuit. When the tubes are placed end on, they attract one another; no repulsion takes place, which would occur if the effect were of a static nature. These investigations are of special interest, and will doubtless be followed up in many electrical laboratories.

Mr. Cyrus O. Baker, Jr., the platinum importer, and Mr. H. L. Shippy, secretary of Roebling's Sons, recently returned from Europe. Both of these gentlemen, because of their large metal holdings, take a lively interest in the present session of Congress and the proposed silver legislation. The Russian government at one time coined platinum as money, Mr. Baker possessing a specimen of it.

W. H. PREECE, OF LONDON—(SEE INTERVIEW ON PAGE 323).

Electricity in Metallurgical Laboratories.

In a recent number of the *Zeitschrift für Angewandte Chemie*, Herr W. Borchers recommends the use of furnaces heated by the electric current on the ground of its convenience, rapidity and cleanliness. Herr Borchers then proceeds to describe a furnace designed by him for ore roasting operations.

He also describes an apparatus adapted for fusions and reduction when the use of an iron crucible is permissible.

All the electrical interests of this country should be represented at the Electrical Congress. It begins August 21st, at Chicago.

THE WORLD'S FAIR.

"BIG, GRAND, INSPIRING, WONDERFUL," YET UNVISITED—FORTY SEVEN NEW CHICAGO HOTELS HAVE FAILED—BIG RESTAURANT PRICES PARALYZES OUR CORRESPONDENT — HOW TO SEE THE FAIR—AN IMPRESSIVE ELECTRICAL SCENE.

All reports to the contrary notwithstanding, the attendance at the Fair has not been nearly what was expected. The class of people who came during May and June had money to spend and spent it rather freely. The people now in attendance appear to be mostly from the South and West, and belong to that class which attends country fairs, church picnics and strawberry festivals. They bring their lunches in packages and baskets, and to all appearances spend as little money as possible.

The hotel people feel this state of affairs most keenly, and this is shown in the fact that 47 hotels of all kinds have failed during the past few weeks. Hotel proprietors claim that no one is making any money except a very few concessionaires on the Midway Plaisance. The truth is that the close of the greatest fair in the history of the world will witness more wrecked hopes than fortunes made, unless some miracle is performed to get people to come to Chicago, visit the Fair and spend money.

The lack of attendance from the Eastern States is remarkable. New Yorkers especially are conspicuous by their absence. The recent financial depression doubtless explains this fact.

The great number of new hotels and other buildings erected in the vicinity of Jackson Park has made lots of new business for the local electric light companies. Both arc and incandescent lights are used in profusion. But it's a question whether poor collections and bad accounts will not overbalance any profit there may be in this temporary business for the local illuminating companies.

Big, grand, beautiful, inspiring, time-absorbing, wonderful World's Fair!

Don't patronize the Casino restaurant. The prices are outrageously high, the portions extremely meagre, and the service miserably poor. Examples: Roast beef, 75 cents for one slice; Moët et Chandon champagne, $5 per quart.

When you come to the Fair, the best thing to do in order to overcome the impressive vastness of the White City, which has a certain mild discouraging effect on the eager sightseer, is to acquire a general idea of the "lay of the land." A map will help you, to a limited extent, but I would advise you to pursue this course first: Take one of the electric launches and make the round trip through the basins and the lagoons. The trip costs 50 cents, and occupies about an hour. This gives you a splendid idea of the architectural and landscape beauties of the World's Fair, and assists you to locate the various buildings in your bump of locality. There are fifty launches running under one minute headway at about six miles an hour. There is no noise, no dirt, smoke, steam, offensive naphtha odors or vibrations. The attendants are well qualified for their duties, and answer all reasonable questions readily and politely. There is no pleasanter mode of water travel than a trip in an electric launch. Judging from the number of passengers I see in the launches I should think the concession a profitable one for the Electric Launch and Navigation Company.

After the launch trip go to the nearest station of the Intramural elevated electric road and make a tour of the grounds on that. The fare is 10 cents, and you can spend half an hour on the cool open cars with pleasure and profit. This ride will give you a semi-bird's-eye view of the Fair, and enable you to see to better advantage the entrances and exits of the buildings, a matter which you will find it advantageous to know.

I wish that Col. Hain and the directors of the Manhattan Railway Company, if they have not already done so, would come to the Fair and make an extended study of this elevated electric railway; I think they would be convinced that electricity is the proper and only motive power for elevated railways in large cities. The General Electric Company has set up a splendid object lesson to rapid transit people in this Intramural road.

Now, then, leave the elevated road at the Midway Station, descend to earth again for a few minutes and walk half way down the Midway Plaisance, taking in what strikes your fancy on the way. You will come, at the half-way point, to the great Ferris Wheel, a ponderous machine in reality, and yet appearing at a distance like a frail bicycle wheel. Pay 50 cents and go around twice. The earth will appear to slip away from under you until it has descended 264 feet, and there lies spread out before you the whole World's Fair, some of Lake Michigan, and a large part of Chicago. Feast your eyes well and store your mind with what the intelligent guard tells you, for such another grand opportunity to view such a magnificent sight may not pass your way again. Here is a genuine bird's-eye view.

The Ferris Wheel of the Fair is an engineering triumph inspired by daring faith, and carried out by indomitable pluck. It is grand; and as for novelty, is far ahead of the Eiffel Tower.

Now you know more about the locations of buildings and points of interest at the World's Fair than you could learn from eleven guide books and a week of tramping around the grounds. You will find, by this time, that the day is pretty well spent, but if you want to put on an extra finishing touch, take one of the large steam tugs in the Grand Basin and go out on Lake Michigan, where you get a splendid sight of that portion of the Fair fronting on the lake.

Tired, are you? Well, go back to your hotel, get some dinner, and, while you eat, determine on your programme for to-morrow, and then get a good night's rest, for World's Fair sight-seeing is a tiresome task. You will probably dream that the Intramural railway is speeding around the circumference of the Ferris Wheel while it revolves, and you will wonder why the electric launches have suddenly changed into flying machines circling over a great White City covered with polka dots and stripes of colored lights.

Such a profusion of electric lights as one sees in the buildings and on the grounds of the World's Fair has probably never been viewed by mortal man before. Arc and incandescent lamps are everywhere. The white buildings reflect the lights and make the scene as bright as day. On those nights when every lamp is burning, the electric fountains playing, and fireworks are shooting up from the lake, the scene is almost beyond description. No picture can do it justice—it must be seen. The Grand Basin is outlined in living fire, the surrounding buildings glow with light, the massive dome of the Administration Building, crowned with electric lamps, rises heavenward in graceful curves, while the electric fountains shoot forth ever-changing sprays of colored water. Involuntary applause breaks forth among the spectators ever and anon, as they sit and stand about in open-eyed astonishment at the grandeur of an artistic accumulation of electric lights.

Last Saturday evening the American judges in the Department of Electricity tendered a banquet to the foreign judges of award in the same department. Two of the German judges intended leaving the Fair, and it was desired to return some of the courtesies which the German representatives had shown the other judges. The banquet was laid at the Chicago Beach Hotel, and was well attended by prominent electrical men from foreign countries.

"The American Institute of Electrical Engineers has finished all its work in connection with the International Electrical Congress," said Secretary Ralph W. Pope. "The congress committees are pushing ahead rapidly with the preparations, and the congress promises to be eminently successful."

STEPHEN L. COLES.

World's Fair, August 12.

In the mines of the United States there are at present in use about 30 electric locomotives.

It is probable that when the cold weather sets in the electric cars of the Jersey City and Bergen Railroad will be heated with electricity. Already the company has several cars with heating apparatus placed under the seats where they extend from one end of the car to the other. Last winter the cars were heated by coal stoves, and the cars on the North Hudson County Elevated Road were heated by means of charcoal pans, or "peanut roasters," as they were popularly termed. This year the North Hudson County Railroad folk may also adopt the electric system of raising the temperature in the trolley cars.

A new electric street railway system now being tried in Detroit, Mich., is described by a local paper as follows: The current is applied by means of an underground wire to an underground switch, which is connected with a third rail running through the center of the track. This third rail is not continuous, but laid in sections, none of which is "live" or dangerous, except the one over which the car is passing. As the sections are only eight feet in length, and the smallest car about 20 feet, it will be seen that all danger from contact with a live section is entirely avoided. The third rail being connected with automatic switches, one section of rail becomes "dead" as soon as a car passes to the next section. Beneath the car are arranged two brushes, fore and aft, which are just far enough apart to insure the car reaching one section of the third rail after leaving one. It will be seen, therefore, that the car must be present to make any section of the rail "live," and then the rail is covered by the car. The wires are entirely buried, and, therefore, cannot come in contact with anything which could be harmed. The operating switches can be placed either inside the rails, or in an alley running parallel with the street, thus doing away with the necessity of digging up the street if anything should get out of order.

ELECTRIC RAILWAY AND POWER NOTES.

In one day, recently, the Montreal Street Railway Company carried 106,000 passengers.

The Marlboro, Mass., Electric Company are gradually taking possession of their new plant, all parts of which are found to work satisfactorily.

A contract has been made with the Ottawa, Ont., Electric Railway Company for the conveyance of mails between the post office and the railway depots in the electric cars in that city.

The North Dallas, Tex., Traction Railway was sold by E. O. Tenison, trustee. It was bought by C. L. Wakefield for $25,000—$5,000 in cash and balance when papers are received by the court.

The electric power plant which is located at the gorge near Winooski, Vt., is almost ready to be put into active operation. Its principal use will be to supply power for Burlington's electric street car line.

A street car line at Birmingham, England, has been operated satisfactorily with storage batteries for 12 months. No trouble was experienced during the winter months, and it is stated that not a single plate of batteries has yet needed renewal or repairs. The storage battery company has guaranteed to maintain the efficiency of the cells and connections for seven years at a charge of three cents per car mile.

The Woonsocket, Mass., Electric Machine and Power Company will erect a 143-foot front, 35 feet deep and 29 feet high business structure of pressed brick on their Main street property in the near future. The lower story will contain five stores, and the upper story will be fitted up for offices. The building will be heated by electricity, and will be the first building in the city to be heated in this manner.

The trolley wires of the Electric Street Railway, in Louisville, Ky., have been placed in position on Main, Market, Spring and Thirteenth streets, connections have been made and it is expected that the street car system of the city will be operated by electricity next week, the delay now being occasioned by the fact that the Light, Heat and Power Company have not yet completed their arrangements for furnishing the power. Additional machinery has been contracted for and a portion is now in position.

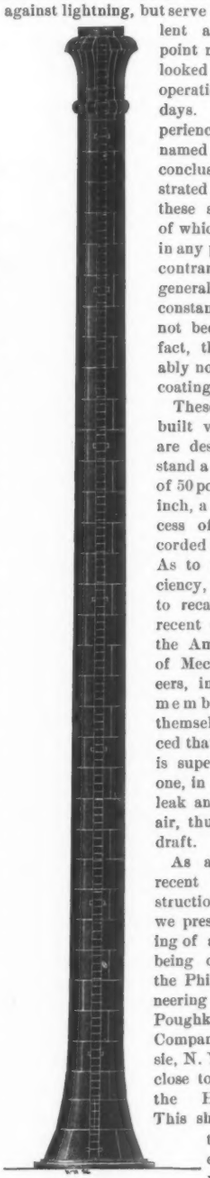
The Chaudiere Electric Light Company will go ahead themselves with the erection of their new steam power building at Chaudiere, Ont. Last evening at the meeting of the directors seven tenders were opened for the supply of the necessary machinery. The contract, however, was not awarded, the company deciding to put in the plant themselves. Building, plant, etc., are expected to cost $20,000. It is the intention to equip the new station with a 1,200 horse-power plant to start with, and make provision for extensions as required. The station will be near Pooley's Bridge.

The Brooklyn City Railroad Company closed its transfer books last week in order to issue the 300,000 shares of stock at $10 each authorized a year ago, which will increase the capital of the company to $12,000,000. The money is to be used in extending and equipping the trolley lines of the company. The stockholders have the privilege of taking up the additional stock in proportion to their present holdings. The first payment must be made by August 25, and the final one a month later. Some of the stockholders would like to have the issue deferred on account of financial stringency. President Lewis stated that the company needed the money. He did not think the stockholders would be severely dealt with, but could not say whether an extension of the time for the payment for the stock would be granted. A report that the Brooklyn Traction Company would not perfect its arrangements to lease the property of the Brooklyn City Company and guarantee ten per cent. dividends was emphatically denied.

Iron and Steel-Plate Chimneys for Electric Plants.

In spite of the increasing use of iron and steel-plate chimneys, the impression still seems to linger in the minds of not a few that these structures are mere shells, requiring guys to keep them in position, and that they are not to be thought of in connection with a first-class plant. This idea, however, is entirely erroneous, as demonstrated by the success met with by the Philadelphia Engineering Works, Limited, of Philadelphia, who have for many years constructed iron and steel-plate chimneys with great success, among these being many connected with the largest steel plants in the country.

These shafts, rising to heights of 200 to 300 feet, are not only excellent protection against lightning, but serve also as an excellent advertisement, a point not to be overlooked in business operations in these days. The long experience of the above-named company has conclusively demonstrated the stability of these structures, none of which has ever failed in any particular, and, contrary to what is generally supposed, constant painting has not been required; in fact, they have probably not averaged one coating in five years.



These chimneys are built very strong and are designed to withstand a wind pressure of 50 pounds per square inch, a pressure in excess of any ever recorded in this country. As to their draft efficiency, it is interesting to recall a series of recent debates before the American Society of Mechanical Engineers, in which many members expressed themselves as convinced that an iron casing is superior to a brick one, in that it does not leak and draw in cold air, thus checking its draft.

As an example of recent chimney construction of this type, we present an engraving of a chimney now being constructed by the Philadelphia Engineering Works for the Poughkeepsie Iron Company, Poughkeepsie, N. Y., to be placed close to the banks of the Hudson river. This shaft is 7 feet in the clear diameter of the iron work, and 125 feet high above the foundation. This stack is of moderate size and more likely to be called for than larger ones. The same rules, however, which are employed in calculating the stability of this stack, and its capacity in its application to boilers, etc., would be used in smaller and larger stacks. It has been asserted that this stack can only be thrown down by upsetting the foundation, and yet it will be observed that the foundation is spread to a very considerable extent, which spreading is provided to give a long leverage of resistance, and therefore requiring much less weight in the superstructure.

This stack is built strong enough to withstand ten times the heaviest stress which will ever be put upon it in practice. This has been done to remove all possible ques-

tion as to strength, and also as an unanswerable reply to the objection that these stacks weaken in time by rusting away. It is calculated and claimed that this chimney may rust away to one-quarter its original thickness, and still exceed in strength and stability any brick structure ever reared. We are indebted to *The Manufacturer*, of Philadelphia, for the illustration of the chimney shown herewith.

W. H. PREECE.

INTERVIEW WITH ONE OF ENGLAND'S MOST EMINENT ELECTRICIANS.

Among the several distinguished electrical workers from abroad who will be present at the Electrical Congress in Chicago next week, none will be more heartily welcomed than Mr. W. H. Preece, of London. A former visitor to this country, he will be greeted by many old-time electrical friends. We are pleased to be able to present in this issue a most excellent likeness of Mr. Preece, as well as a view of his office, with its electrical belongings. During the Paris Exposition of 1889 many American electricians visited Mr. Preece at his London office, and the picture here presented will be a familiar one to them.

We are indebted to our esteemed London contemporary, *Lightning*, for these illustrations and for the interview which follows:

I was strolling down towards the Mansion House on the day when our newly elected civic functionary makes his progress in state along the streets and boundaries of the city; and finding myself blocked at the junction of Newgate street and Aldersgate street, by reason of the crowd of sightseers that surged in every direction, I fell to contemplating the architecture of a large building on my left.

"How," I enquired of a stalwart myrmidon of the peace, "does it happen that so many different styles are incorporated into this single building? Was it built at different epochs, or are its uses equally various?"

"Concerning that," he replied, "there is a legend, which, if I stopped to tell you, some of these good folk might be getting run over, and that is more than my place is worth. Know, however, that this is a government building, and was designed by an ambitious minister who could not understand the modesty of his architect in wishing to display but one style only—Gothic, Ionic, Corinthian, or whatever it might be; so, 'pooh poohing' all the architect's plans, he said to himself, 'I will design a building that shall eclipse all other buildings in the world, and I will use upon it not only the five styles which they have endeavored to explain to me, but will invent a sixth style of my own, for the basement, so that all men shall marvel.' And that, sir, is the explanation of those pillars with curious nicks cut in them, like rings on a hazel-stick, as I have sometimes fancied."

"Thank you, my good man," said I. "I gather from what you say that these must be the telegraph offices, designed by Mr. Ayrton."

"You are about right," he replied.

"What is your opinion of public buildings generally?" I asked. "Do you consider them worse or better than those erected by private individuals? And in the case of public and private work generally, what are your views?"

"As for that, sir," he replied, "beyond the difference between a public house and a private house, it is little I know of the matter; but Mr. Preece in there, he will tell you all you desire to know far better than I could do, for he is a learned man."

"And do you think," said I, "that Mr. Preece would be willing to waste his time in answering my questions?"

"By the gods," said he, "I believe you could not catch him at a more opportune moment, for all his men have gone out to see the show, and he himself is sitting all alone, as you may prove by looking through yonder window."

Thus encouraged, I entered the building; and when I had introduced myself, I repeated my question concerning the relative merit of public and private works.

"It is strange, my friend," said Mr. Preece, "that you should have come to ask me that question, for here I have before me a report which I am preparing for the Corporation of Great Yarmouth, dealing in a manner with this very subject."

"That," said I, "is indeed strange."

"The point I have before me refers to the advisability or otherwise of a public body undertaking the supply of electric light."

"And do you consider it advisable?"

"Most undeniably," he replied; "and I shall be happy to tell you my reasons and see if I cannot convince you that I am right."

"You are very good," said I, "and I doubt not you shall find me a willing convert."

"I suppose you admit that there are two classes of commodities in common use, some which are necessities and others which are luxuries."

"I admit it."

"And that the necessities are few in number, comprising such things as water, fresh air, sanitation, police, facilities for traffic, and so on?"

"Certainly."

"How should you class the supply of light, both for private purposes and for street lighting—as a luxury or as a necessity?"

"A necessity, undoubtedly."

"And if I could show you that one kind of light was superior to all others, both from the safety with which it can be used, and from its cleanliness, purity and protection of health and property, should you not say that this particular kind of light was a necessity?"

"That would depend, I think, on its costliness as compared with other kinds. If it were very expensive it might rank, perhaps, with certain things which are a necessity to the rich man, but a luxury to the poor one."

MR. PREECE IN HIS LONDON OFFICE.

"But if I proved to you that the cost could by certain means be brought so low as to compare favorably with all other forms of light, then should you admit that it was a necessity?"

"I should feel strongly inclined to do so."

"Now in what do you consider lies the cost of an article? In its price merely, or in the expenses incident to its use as well?"

"In both, certainly."

"Should you not say, therefore, that a form of light which slowly destroyed or dirtied pictures, books, decorations, and almost every kind of salable article, which vitiated the air in rooms, gave an inferior result, and was subject to continual waste, even when not required for use, started badly in point of expense as compared with a light which was subject to none of these drawbacks?

"You mean gas and electricity, of course; and if the facts are as you state, I should. But can you actually show that the substitution of the one for the other makes any difference to health, for instance?"

"In certain government offices and public buildings, as I have frequently stated, the electric light has more than paid for itself in the increased health of the employés and consequent diminution of absences. In the Post Office Savings Bank the number of days of absence per employé was diminished by two per annum, and as there were more than 1,500 people employed, this meant 3,000 extra days, the value of which quite paid for the light. This without taking into account the other points I mentioned."

"Well, and now as regards the actual expense of production, does that also admit of comparison with gas, oil, etc.?"

"I will give you actual facts. In nine great towns of England the average consumption of gas per five foot burner is found to be 3,000 cubic feet per annum. This at 3*s.* per 1,000 cubic feet, the average price over the whole country, means an annual expenditure of 9*s.* per burner.

The average consumption of electrical energy per 35-watt lamp, the equivalent of a 5-foot burner, is shown by those admirable returns which you publish every week to be 18 Board of Trade supply units per annum; which at 6*d.* per Board of Trade unit, also means 9*s.* per lamp per annum. So you see that gas at 3*s.* per 1,000 feet is exactly equivalent in cost to electricity at 6*d.* per unit, a fact which cannot be too widely known."

"And is 6*d.* per unit a fair price for electricity?"

"That depends on local circumstances. The average cost of production of nine large companies last year was 4.76*d.* per unit, and this rate is becoming so fast diminished, as the number of customers increases, and as the engineers gain experience of the demand, that in the case of one of those nine companies, the Kensington and Knightsbridge, the cost of production is said to have fallen already from 5.17*d.* to 1.173*d.* per unit supplied. If the charge, which is now nominally 8*d.* per unit, be reduced in proportion, you will see that 6*d.* is a very fair price indeed, and is soon likely to be thought excessive."

"If I recollect rightly, you have yourself carried out certain tests in this direction on a commercial scale?"

"I have, at Wolverhampton; and I found that the cost of generating current in connection with a certain electrolytic process was but 3*d.* per unit (or kilowatt hour). That was, however, taking coal from the neighborhood at 7*s.* 6*d.* per ton, and allowing nothing for the cost of works management, direction, distribution, redemption fund, rents, etc., most of which have to be added to the expenses of production in the case of a supply company."

"The main point is that, as custom increases and the load on the machinery fills up, the cost of production is diminished?"

"That is the great point to bear in mind in dealing with the cost of electric light."

"Then the statements of those who say that electricity is two or three or four times more expensive than gas are incorrect?"

"Absolutely incorrect; and I am surprised that one of your electrical contemporaries should display such ignorance of a current. This dread is described as "the usual initial difficulty;" such patients are always hypersensitive and shrink from a proceeding which they are accustomed to associate with a shock. The treatment consisted of both local and general applications, mostly with continuous currents. The general treatment took the form of dipolar electric baths, commencing at 50 milliamperes for five minutes, and concluding with 150 milliamperes for 15 minutes. The local applications were made to the head in various ways with a current from two to five milliamperes for five minutes. The result was that the patient's sleep steadily improved till it reached an average of six hours out of the 24; "that is to say, that after seven weeks of treatment, consisting of about 30 seances and 12 baths, sleep was practically restored. Not only this, but the general health and moral condition were strikingly improved. Instead of dark forebodings and pessimistic views, he talked cheerfully and hopefully of going back to work again."

The case of the Mississippi State Revenue Agent against the Postal Telegraph Cable Company, to enforce the payment of taxes of $1 per mile for three years, amounting to $927, was last week decided in favor of the plaintiff by Judge Chrisman, of the Circuit Court. The case goes to the Supreme Court of the United States.

Insomnia Cured by Electricity.

The following is an account of a typical case of insomnia which was successfully treated by electricity. The form of the affection dealt with was that which usually accompanies neurasthenia or debility of the nerve centers. The symptoms of the disease are fully described, and are those with which a great number of people are only too well acquainted in these high-pressure times. The patient at first showed great fear of the

Lightning and Strong Current Arresters as Used for the Telephone.

READ BEFORE THE SOCIETY OF ARTS, BOSTON, BY I. H. FARNHAM.

(*Continued from page* 317, *No.* 25.)

It would seem at first thought difficult to construct a magnetic device which would not be responsive to lightning discharges and yet would operate with the much feebler currents, even "sneak" currents. This has been accomplished, and is illustrated by Figure 9.

The electro-magnet shown in this figure is

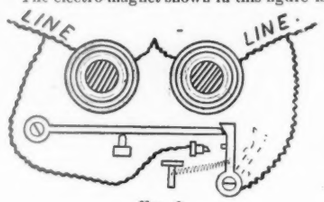


FIG. 9.

supposed to be the regular working magnet of the instrument to be protected—a telephone bell, for instance. Beneath, or at one side of the magnet, is fastened an auxiliary armature, so adjusted that it will not respond to the working currents but will move upward with stronger ones. In its normal position this armature prevents a lever from answering to the gentle pull of a spring and moving forward against a contact point so connected as to shunt out the bell when the contact is established. If now a cross occurs with a light or power wire the armature moves, releasing the lever, and the protection is accomplished. It will be noticed that the form of the armature end and of the lever which rests against it are such that, on the quick upward movement of the armature, the lever is thrown back for a moment, and by this backward movement allows the armature to return in season to catch the lever before it has had time to pass under the

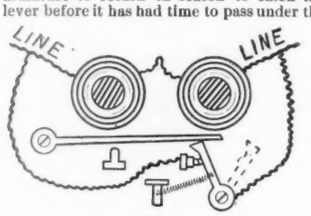


FIG. 10.

armature. This would occur if the discharge through the magnet coil is momentary, as is the case of usual lightning discharges. Figure 10 shows this protector after it has been operated by a continual dangerous current.

A protector, resembling in construction a pile driver, has been devised by Mr. Morse, of Cambridge, Inspector of Wires for that city, and is in use on some of the city lines. The hammer is released by the magnet when excited by a heavy current. In falling it closes a shunt around the instrument and puts a ground on the circuit. It is novel in construction, but in principle like some other forms operated by the magnet.

The fourth and last class embraces "*protectors operated by heat*." They are admirably adapted for detecting and arresting the so-called "sneak" currents, while at the same time they are free from the objection of being affected by ordinary lightning discharges. A few forms are illustrated. Fig. 11 is a thermostatic bar placed close beside the working magnet of the instrument to be guarded, arranged to move backward when warmed above 100°, establishing a contact which shunts the instruments. It is auto-

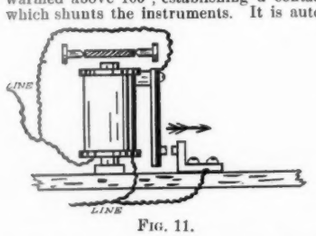


FIG. 11.

matic, but too slow in operation for any other than the smallest objectionable currents. Fig. 12 shows a small metal tube or box placed against the coil of the magnet; through this box passes a thread which normally holds a flat spring away from its shunting contact. Within the metal box is also placed a little composition—not unlike that used upon the end of a friction match. The undue heat of the magnet when exposed to foreign currents ignites the thread and allows the shunting spring to operate and cut out the instrument. This reminds one of the tales of Western prairie life, where, to save the home from destruction by the oncoming prairie fire, the mother, alone and realizing the peril, hastily catches a match and lights the grass about the cottage, beating it back and controlling it until it has diverted the prairie flames. It is fire to prevent fire.

Next, we have in Figs. 13 and 14 two forms of the "wax ball" protector; one for shunting the instrument, the other for widely opening the line.

A wax ball is held against the magnet coil of the instrument to be protected by the gentle pressure of a spring. Upon passage of a current of sufficient strength to warm the coil the wax softens, allowing the spring to move toward the coil until it makes contact with another spring or stud, the spring pressing the wax ball, and its contact being so wired that when there is a connection established between the two a shunt circuit is formed around the instrument. In the other form the movable wax ball support releases a spiral spring, which, instead of shunting the instrument, opens the main circuit widely, thus interrupting the dangerous current.

The particular advantage of this protector is sensitiveness to continuous currents, which are only strong enough to endanger the finest magnet wire, while, at the same time, it is not troubled by lightning discharges. Other advantages are no extra

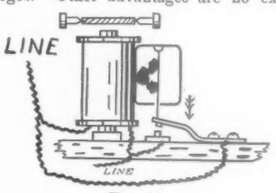


FIG. 12.

magnets, resistance or connections in the working circuit.

As already pointed out, a fuse to protect from such a current requires to be extremely sensitive, carrying not more than one-quarter or one-third of an ampere, and from its delicacy would be very frequently destroyed by discharges too feeble and of too short duration to be of any danger to the apparatus.

There are protectors in which the fuse wire is coiled upon itself for increasing its sensitiveness to the heating effect of the current. These, not being simple fuses, I have classed with the thermostatic devices.

Having described and shown only a few of the characteristic protectors designed for telephonic as well as other delicate electrical apparatus, allow me in a few words to explain how the telephone instruments in this vicinity are protected at the present time. The aim has been to protect from the whole range of dangerous currents, both

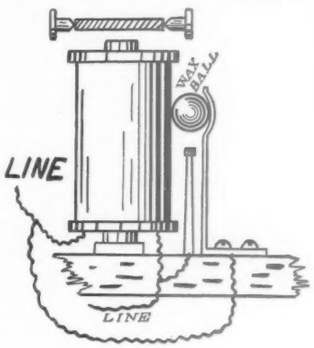


FIG. 13.

"direct" and "alternating" in character, including instantaneous disruptive discharges, long continued heavy currents, and those only just strong enough to do harm.

It has been the aim, also, to protect a metallic circuit from electrical charges which would be dangerous to persons, and which might not under certain conditions be dangerous to the apparatus. In exchanges where all these hazards exist there is employed, at the telephone subscriber's stations, a combination of three arresters heretofore described.

1. The wire, as it enters the building, is attached to a simple lead fuse six inches in length, protected in an asbestos-lined box; this fuse will melt at six amperes of current in 10 seconds, and is sufficiently sensitive to prevent danger of overheating the leading-in wires, while it will not be troubled by ordinary atmospheric or lightning discharges.

2. Near the fuse, between it and the telephone instrument, is placed an air space carbon plate arrester, operating at a difference of potential of 300 volts and upwards. This arrester is usually located within the box which incloses the fuse. See Fig. 15.

3. A thermostatic device for taking care of the weaker currents is combined with and located near the fuse, or in many cases is applied to the bell magnet, and then is known as the "wax ball" protector.

The carbon plates contain within an aperture near the inner surface a disk of fusible alloy for destroying a continuous arc, and thus preventing the danger of fire from this source. This would happen only when high potential currents of too small quality to open the fuse were present.

The protectors in use to-day have been the subject of much study and have undergone many modifications. Dr. Hayes and Mr. White, both well known to this Society,

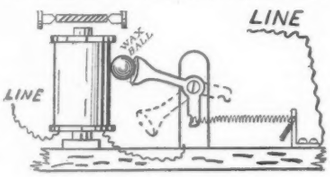


FIG. 14.

are credited with improving much of this apparatus, particularly that employed at the central offices. F. A. Pickernell, of New York, has accomplished much in perfecting this system of protection. The central office protectors are the same in principle as those at the subscribers' stations, the fuse being located at the outer end of the cables, one on each wire; a "heating" or thermostatic coil and an air space arrester being placed at the office end of each wire as it emerges from the cable. In the central office protector, instead of using wax as the thermostatic portion, soft solder is employed, which upon melting allows a spring to move against a contact point and thus throw on a ground between the line and the switchboard. When this happens the annunciator resistance (usually 500 ohms) is shunted, and the current generally increases sufficiently to operate the fuse; if not, it is too feeble to do further harm. Fig. 16 illustrates the operation of this combination.

Fig. 17 is a graphic blackboard illustration of the fact that no one or two of these protectors will cover the entire range of dangerous currents, but the three taken together very nicely do so.

In fact they slightly overlap each other in the particular function each has to perform.

The fuse interrupts a continued heavy current.

The carbon plate air space arrester takes a high potential discharge.

The heating coil disposes of the current, which is not so heavy as to melt the fuse, not so high pressure as to jump the air space, and yet sufficient to endanger the electromagnets of the apparatus to be protected.

We find in practice some trouble with the air space arrester by its occasionally becoming grounded. It is not serious, however, as will be evident from the fact that in the Milk street office, Boston, employing about 10,000 of these arresters, the average is about one trouble per day. The removal of this objection is being studied with good

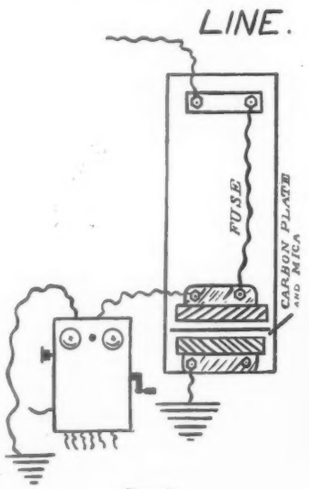


FIG. 15.

promise of a remedy. Observations of a large number of accidental contacts with electric light and power wires have confirmed us in the belief that as a thorough protection for telephonic apparatus this system, consisting of fuse, heating or thermostatic coil and air space arrester, has few, if any, equals.

[The operation of some of these protectors under widely differing conditions of current was then illustrated by tests made by use of currents of 100 to 500 volts furnished by the Institute dynamos.]

Worship by Telephone.

We are informed by the London *Telegraph* that the parish church at Chesterfield has a telephone with 40 or 50 subscribers. At one time the pulpit transmitter was placed underneath a cushion covering the stone top, a circular piece being cut out of the cushion for the purpose. A strange preacher, not knowing of its existence, put his watch in the circular aperture, thinking it to be a receptacle designed for such use. The next day persons who listened to him through the telephone said that they had heard him very well, but they thought he must have been wearing a very loud "ticker," as it made quite as much sound as he did.

Some people object to telephones as applications of mechanism to spiritual things, but the *Telegraph* replies to the objection by saying that it ought in fairness to be made to the multiplication of books by successes of the printing press. The Pope's blessing has

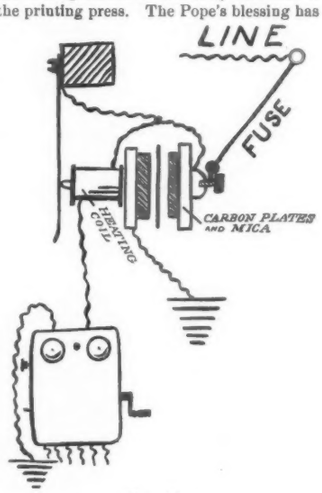


FIG. 16.

been sent by telegraph; why may not a sermon be transmitted through a wire? Queen Anne was in the habit of hearing the Church of England service in her dressing room—her chaplain reading the lessons, the prayers, and the sermons in the adjoining apartment while the door was open. Her majesty's toilet proceeded all the time, but at certain stages of it the bed-chamber women closed the door. This did not interrupt the service until a certain sturdy divine stopped one day and refused to go on; "he would not whistle the word of God through a keyhole." Possibly there may be some fastidious rectors who will refuse to preach or pray through a telephone.

When Norman Macleod was appointed to one of his earlier parishes, he heard that there was an old dame who would not accept him as her pastor until she was satisfied of his orthodoxy. The genial doctor consented to call upon her and stand any test. When he sat down by her for this purpose she lifted, to his horror, a gigantic ear trumpet, and motioned him to speak through it, saying, in solemn tones, "Gang o'er the fundamentals." Many would have been appalled at the idea of shouting theology down a

FIG. 17.

tube, but Norman was equal to the occasion, and acquitted himself triumphantly. It is not everybody, however, who has his quickness and wit, and it may tend to paralyze some preachers if they remember the unseen auditors listening to them a mile or two away. And, besides all this, will Mrs. Grundy be satisfied, when she reproves a young man for his neglect of church going, to hear him respond, "Oh! I heard the sermon through a telephone at home!"

Parsons' Steam Turbine Dynamo.

The accompanying illustration shows the Parsons' steam turbine dynamo, of which Prof. A. B. Kennedy, of London, has made some recent tests. It was demonstrated that only 20.3 pounds of water per electrical horse-power was used. This remarkable result shows the adaptability of the steam turbine for driving direct coupled dynamos.

The text of the report in *London Engineering*, in which journal this illustration appeared, shows that this turbine will do all that is claimed for it by the manufacturers. Subjoined is the report of six tests arranged in tabular form:

EXPERIMENTS ON PARSONS' STEAM TURBINE DYNAMO AND ALTERNATOR. HEATON WORKS, APRIL, 1893.

	A	B	C	D	E	F	G
Duration of trial in minutes	85.5	34.0	72.0	93.0	122.0	46.5	7.0
Mean boiler pressure, lb. per sq. in.	95.8	94.5	97.0	94.6	97.1	97.1	97.0
Corresponding mean temperature, deg. F.	335.2	337	336	334.4	334.3	336.1	336
Average engine temperature close to engine, deg. F.	330.3	331.8	356	371	401	391	380
Amount of superheating	.....	.....	20.0	36.6	66.7	54.9	44
Mean vacuum, lb. per sq. in.	14.3	14.1	14.28	14.28	13.95	14.11	13.8
" injection temperature, deg. F	59	63.3	64.4	58.6	70.7	61.7	.....
" hot-well temperature, deg. F	89.6	88.9	72.9	75.2	89.8	89.6	.....
" revolutions per minute	4366	4385	4490	4475	4665	4625	4592
" actual horse-power	1005.5	.....	1005.3	998.7	1493.3	1276.5	1276.5
" electromotive force, volts	.....	267.2	264.9	261.3	263.7	254.9	261.7
" electrical horse-power	.....	.....	27.94	68.8	110.8	123.0	152.6
" kilowatts	.....	.....	27.45	92.21	148.5	164.9	204.6
Total water used, lb.	570	570	1490	8330	6290	2590	.....
" per hour, lb.	653	653	1293	2146	3064	3342	.....
Water per kilowatt hour, lb.	.....	.....	14.1	21.3	27.9	27.2	.....
" electrical horse-power hour, lb.	.....	.....	22.9	23.3	27.6	30.8	.....

The engine worked throughout the trials without giving the slightest trouble in any way, either at low or high loads. The throttle valve was full open in each case, and the engine ran upon its governor, which appeared to control it in a satisfactory manner.

American Electro-Therapeutic Association.

The following is the preliminary programme of the American Electro-Therapeutic Association, which will hold its third annual meeting in Chicago, September 12, 13 and 14.

DISCUSSIONS.

(1) "What are the Possibilities of Electricity in the Treatment of Fibroid Growths." Discussion will be opened by Dr. J. H. Kellogg, of Battle Creek, Mich.

(2) "The Influence of Frequency of Interruptions and Character of Induced Current Waves upon Physiological Effect." Discussion will be opened by Professor J. W. Morton, of New York.

SEVERAL PAPERS WILL BE READ; AMONG THEM WILL BE THE FOLLOWING:

"The Nutritional Effects of Statical Electricity." By Prof. W. J. Morton, M.D., New York.

"The Graphic Study of Electrical Currents in Relation to Therapeutics." By J. H. Kellogg, M.D., Battle Creek, Mich.

"The Action of the Continuous Current within the Living Tissues as Distinguished from the local Polar Action." By Prof. W. J. Herdmann, M.D., Ann Arbor, Mich.

"The Therapeutic Application and the Theory of Alternating Currents." By Dr. Georges Gautier, Paris, France.

"The Treatment of Fibroid Tumors with Electricity." By Dr. Georges Gautier, Paris, France.

"Induction Coils." By Mr. A. E. Kennelly, of the Edison Laboratory.

"Electrolysis in Tumors of the Bladder." By Robt. Newman, M.D., New York.

"The Present Position of Electricity in the Treatment of Ectopic Gestation." By A. Brothers, M.D., New York.

"The use of Static Electricity in the Treatment of Incipient Insanity." By W. F. Robinson, M.D., Albany, N. Y.

"The Absorption of Fibroid Tumors by Mild Electric Currents." By R. J. Nunn, M.D., Savannah, Ga.

"Some Observations on the Fine Wire Coil or Current or Tension." By H. E. Hayd, M.D., Buffalo, N. Y.

The Electrical Congress.

As the time approaches for the assembling of the World's Congress of Electricians the following will be of interest. It will be remembered that at the meeting of the Advisory Council, held January 17th last, several committees were appointed, and among others a committee to decide upon the number of members that each foreign country should be invited to send to sit in the Chamber of Delegates.

Their apportionment was as follows:

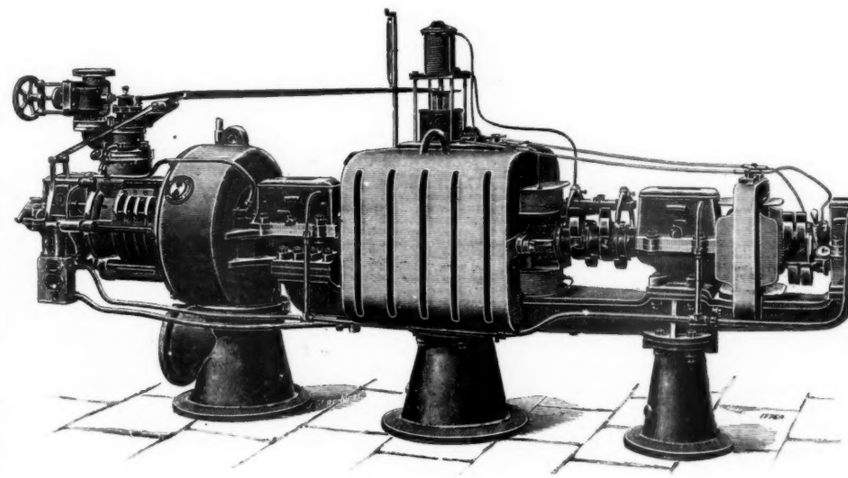
Five each for England, France, Germany, Austro-Hungary and the United States.

Three each for Belgium, Italy and Switzerland.

Two each for Norway and Sweden, Holland, Denmark, Russia and Spain.

One each for Portugal, British North America, Australian Colonies, India, Japan, China, Mexico, Brazil, Chili, Peru and the Argentine Republic, making 55 in all.

Up to the present moment eight of the more important countries have officially responded to the call. We give below the names of the delegates, in the order of their official appointments.



PARSONS' STEAM TURBINE DYNAMO.

England—W. H. Preece, F. R. S.; Prof. W. E. Ayrton, F. R. S.; Prof. S. P. Thompson, D. Sc., F. R. S.; Alex. Siemens and Major Cardew, R. E.

France—M. Mascart, M. Hospitalier, M. Violle, M. de la Touanne.

Germany will be represented by Dr. H. von Helmholtz, who requests that the following gentlemen of the Physikalische-Technische Reichsanstalt, of Charlottenburg, be allowed to attend the meetings of the Chamber of Delegates, namely: Dr. Feussner, Dr. Kurlbaum, Dr. Leman, Dr. Lindeck, Dr. Lummer and Dr. Pringsheim.

United States—Dr. H. S. Carhart, Prof. Elihu Thomson, Prof. Edward L. Nichols, Prof. H. A. Rowland, Prof. T. C. Mendenhall.

Switzerland—M. le Dr. A. Palaz, M. le Dr. Weber, M. Thury.

Italy—Prof. Gallelio Ferraris.

Mexico—Senor Don A. M. Chavez.

China—Mr. Peng Kuang-Yu, Mr. Teng Shen, Mr. Shon Yen.

The request of Dr. H. von Helmholtz in respect to his *confreres* and the appointment by China of three delegates, whereas only one was requested will have to be referred to the Committee on Credentials at the opening of the Congress.

About a thousand invitations in all have been sent out, and from the number of acceptances that are coming in there is every reason to believe that the Congress will be fairly well attended.

The New York and New Jersey Telephone Company is putting in its subways along a number of streets of Jersey City. These subways are to contain the company's wires in accordance with the ordinance which Mayor Wanser approved May 16.

Death of Col. Louis W. Burnham.

Electric circles in Boston have met with a severe loss during the past week in the sudden death of Col. L. W. Burnham, vice-president and manager of the Electric Gas Lighting Company of that city.

To most of his friends and acquaintances the news of Colonel Burnham's death came with awful suddenness, and seemed well nigh incredible, from the fact that at the time of his last appearance among them he was in the best of health and spirits, and was looking forward with much pleasure to a trip to Chicago, where he intended to spend a well earned vacation.

All his preparations were made, and on the eve of his departure he retired in his usual health. About two o'clock in the morning he was seized with a paralytic stroke, from which he never rallied, and which resulted in his death at three o'clock in the morning of August 9.

The funeral services were held at noon on Friday, the 11th, from his late residence in Dorchester, and from there the body was taken to Palmer, Mass., for interment in the family plot.

His residence was crowded with relatives and friends, who gathered there in respect to his memory, and the floral offerings were many and beautiful.

Col. Burnham was one of the pioneers in the electrical industry, having been prominently connected with it for over 12 years, and his fine presence and genial manner made him universally respected and esteemed. He was the head and front of the extensive business with which he was so prominently connected, and had built up a reputation for strict integrity and fair dealing among his business associates of which any man might well feel proud.

He was born in Canterbury, Conn., in 1831, and began his commercial career at the age of 18. His early manhood was spent in educational work, which he followed steadily until 1868, at which time he assumed the management of the New England department of a New York life insurance company. Here, as elsewhere, his efforts were remarkably successful, and he held the position until 1881, when he was elected president and manager of the company with which he has since been so prominently identified.

His success in the electrical field is too well known to require mention, and his personal popularity is attested by the hosts of friends, to whom his death comes home with a sense of personal loss.

Worse Still.

Dashaway—I spent two hundred dollars at the World's Fair.

Cleverton—Does that include the ten dollars that I lent you?

Dashaway—Great Scott, old man, I should say so! Why, it includes five dollars more that I was just going to ask you for.—*N. Y. Truth.*

Which is the Cow and Where is the Milkmaid?

The ELECTRICAL REVIEW apologizes to its subscribers for disfiguring its artistic pages with the accompanying illustration, but as it is a *fac-simile* of a drawing taken from the *Official Gazette* of the United States Patent Office, and as this is an average specimen of the work in that publication, which has reached us after four weeks' delay, we feel

justified in reproducing it. It is fortunate that the department has taken such pains to point out the *essential features* of this work of art, for they would never have been discovered without the explanations.

This number of the *Gazette*, dated July 4, contains numerous illustrations of electrical inventions by Elihu Thomson and others, some of which would be unintelligible without the specifications. Patent No. 500,828, granted to William A. Turbayne, of Detroit, Mich., *for a lightning arrester*, is illustrated by a cut exactly representing a dress shield such as young women wear under their arms. Will the Commissioner of Patent or Mr. Turbayne please rise and explain whether this novel and useful device is intended to protect the young women who wear them, or the young men who go sparking? An article in the last issue of the ELECTRICAL REVIEW gives some reasons for the extraordinary situation in the Patent Office, which it is to be hoped may soon be improved. The difficulties growing out of the political muddle in that department have gone far beyond the inconvenience of inventors and patent attorneys, and have become a dangerous element in the present financial disturbance, which the government should relieve and not aggravate.

The Electrical Congress.

The meeting of the International Electrical Congress will be held at Chicago, August 21, 1893. Mr. C. O. Baker, who has consented to act as master of transportation, has sent out the following notice to eastern delegates:

You are advised that arrangements have been perfected with the New York Central and Hudson River Railroad Company for the transportation of delegates from New York and vicinity on the following schedule:

Leaving Grand Central Station 7.30 P. M., Saturday, August 19, arriving at Niagara Falls the following morning for breakfast, and where a few hours will be spent in sight-seeing, resuming journey in the afternoon, and reaching Chicago early Monday morning, August 21.

Round trip rate, $42. It is essential that all delegates desiring to join this special party communicate at once with the undersigned, stating the number of tickets and space desired in the sleeping cars.

C. O. BAKER, JR.,
New York, 136 Liberty street,
August 12.

In Favor of the Gettysburg Trolley.

Attorney-General Hensel, of Pennsylvania, has refused the writ of *quo warranto* asked by citizens of Gettysburg to take away the franchise of the trolley lines on the battlefield. He decided all the points involved in favor of the trolley company.

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CONTENTS.

	PAGE
Views, News and Interviews	321
Electricity in Metallurgical Laboratories	321
The World's Fair	321
Electric Railway and Power Notes	322
Iron and Steel-Plate Chimneys for Electric Plants	322
W. H. Preece	323
Insomnia Cured by Electricity	323
Lightning and Strong Current Arresters for the Telephone	324
Worship by Telephone	324
Parsons' Steam Turbine Dynamo	325
American Electro-Therapeutic Association	325
The Electrical Congress	325
Death of Col. Louis W. Burnham	325
Worse Still	325
Which is the Cow and Where is the Milkmaid?	325
The Electrical Congress	325
In Favor of the Gettysburg Trolley	325
Pop-Gun Warfare on the Trolley	326
Electricity on Elevated Structures	326
Letters from a Laboratory	326
Correspondence:	
Electro-Copper-Plating of Ships' Bottoms	327
Our Canadian Letter	327
Electric Railways in France	327
A Spanish International Exhibition	327
Electric Traction in Japan	327
To Visit the Niagara Falls Electric Road	327
Wall Street and the Electrical Stock Market	327
Lecture on Electricity at the World's Fair	327
Personal	327
Edison Illuminating Companies	328
The Largest Search-Light in the World	328
Telephone Talks	328
Some Interesting Installations	329
The Westinghouse Conduit System	329
The Sprague Electric Elevator	329
Power from Niagara	329
Struck by Lightning	329
The Westinghouse Company	330
Advance Information	331
A New Reservoir Drawing Pen	331
The Wilmot & Hobbs Manufacturing Company	331
To Estimate the Weight of Iron	331
Kindred Interests	331
Electrical Patents	332

INDEX OF ADVERTISERS.

COVER PAGES.

	PAGE
American Electrical Works, insulated wire	i
American Railway Improvement Co.	i
Ansonia Brass & Copper Co., wire	xii
Armington & Sims, engines	xii
Bliss Co., E. W., foot and power presses	i
Campbell Electrical Supply Co., insulating tape	i
Goubert Manufacturing Co., Stratton separators	xii
Crocker-Wheeler Motor Co., motors	i
Day's Kerite, insulated wire	i
Eastern Electric Cable Co., insulated wire	xii
Eddy Electric Mfg. Co., motors	i
Empire China Works, porcelain specialties	xii
Faraday Carbon Co., carbons	xii
General Electric Co., multipolar transformers	xi
Hampson & C. F., engines	xii
Hulbert Fence and Wire Co.	xii
Jewell Belting Co., belts	xii
Lake & Co., J. H. & D., pulleys	i
Massachusetts Chemical Co., insullac	i
Mather Electric Co., dynamos and motors	i
Moore, Alfred F., wire	xii
National India Rubber Co., wires and cables	i
Okonite Co., insulated wire	i & xii
Paine & Ladd, patent attorneys	i
Rhode Island Tool Co., drop forging, etc	xii
Ridlon & Co., general machinery	xii
Riker Electric Motor Co., motors, dynamos	i
Simplex Electrical Co., insulated wire	i
Stirling Co., boilers	xii
Waterhouse, Gamble & Co., arc lamps	i
Westinghouse Electric & Manufacturing Co.	ii
Weston Engine Co., engines	i
Wilmot & Hobbs Mfg. Co., bell gongs	xii

INSIDE PAGES.

Alexander, Barney & Chapin, electric fan outfits	v
Allis & Co., Edward P., engines	ix
American Bell Telephone Co.	vii
Baker & Co., platinum	332
Barrett, John A., electrical engineer	331
Berlin Iron Bridge Co., iron roofs and buildings	v
Billings & Spencer Co., pliers, etc	332
Blaisdell & Co., machinist tools	viii
Brill Co., J. G., tramway cars	viii
Brown Electric Co., fan motor	iii
Brush Electric Co., apparatus	x
Buckeye Engine Co., engines	ix
Butler Hard Rubber Co., battery cells	ix
Carpenter Enamel Rheostat Co., rheostats	vii
Central Electric Co., supplies	iii
Columbia Incandescent Lamp Co., incandescent lamps	vi
Cutter, George, electrical supplies	vi
Dixon Crucible Co., belt dressing	vii
Edison Decorative and Miniature Lamp Department, incandescent lamps	332
Electric Construction and Supply Co., Ward arc lamps	iii
Electric Selector and Signal Co.	iv
Electrical and Mechanical Engineering and Trading Co., contractors	x
Electro-Light Engraving Co., engraving	ix
Falls Rivet & Machine Co., friction clutches	ix
Fidelity Carbon Manufacturing Co., carbons	iv
General Electric Launch Co., electric launches	iv
Globe Iron Roofing and Corrugating Co.	332
Greeley & Co., The E. S., supplies	ix & 332
Hammond Cleat and Insulator Co., cleats	vi
Harrisburg Foundry & Machine Works, engines	ix
Helios Electric Co., arc lamps	iii
Holmes, Booth & Haydens, insulated wire	viii
Johns Mfg. Co., H. W., vulcabeston	vi
Leclanche Battery Co., batteries	vii
Leffel & Co., James, water wheels	x
Lehigh Valley Creosoting Co., creosoted lumber	332
Marshall, Wm., condensers	iv
Mason Electric Co., primary batteries	vii
National Electric Mfg. Co., dynamo-electric machinery	iii
National Pipe Bending Co., feed-water heater	vi
New England Butt Co., braiding machinery	viii
New Jersey Lamp & Bronze Works, electric and gas fixtures	ix
New York and Ohio Co., incandescent lamps	x
New York Belting and Packing Co., rubber belts	v
New York Insulated Wire Co., wires and cables	ix
Onondaga Dynamo Co., electrical apparatus	iv
Ostrander & Co., W. R., supplies	iv
Partrick & Carter Co., electrical supplies	332
Phillips Insulated Wire Co., insulated wire	iii
Phosphor-Bronze Smelting Co., castings	vii
Photo-Engraving Co., engravings	332
Pope, Read & Rogers	331
Porter Electric Motor Co., electric motors	iv
Queen & Co., electrical instruments	332
Reed & Co., F. E., lathes	iv
Ries Electric Specialty Co., regulating socket	viii
Ripans Tabules	x
Robinson & Orr, steel rails	331
Royce & Marean, electrical supplies	iv
Russell & Co., steam engines	ix
Schuyler Electric Co., arc lighting	viii
Shawmut Fuse Wire Co., fuse wire	332
Shoemaker, Homer, attorney and counselor-at-law	331
Siemens & Halske Electric Co., electrical machinery	v
Standard Paint Co., insulating compounds	v
Stanley Electric Mfg. Co., transformers	vii
Tyndall, Wm. D., attorney	iv
Washburn & Moen Mfg. Co., wire	332
Western Electric Co., supplies	iv
Weston Electrical Instrument Co., measuring instruments	vi
White Dental Mfg. Co., acid gravity battery	332
Whitney Electrical Instrument Co., instruments	vi
Wilson, Fremont, electrician	331

The war of words between the *Western Electrician* and the *Electrical World* is apparently ended. The very few interested should now breathe a sigh of relief.

The dear public and the World's Fair officials have declared themselves for and against Sunday opening. It might not be a bad idea to ask the exhibitors what they think of it.

Now is the time for electrical manufacturers to advertise their snow-plows. The ELECTRICAL REVIEW is a widely read journal—but we hope no one will think we hinted.

We hope that the World's Fair officials will see their way clear towards keeping the exhibition open longer than November 1. By this time the country will have had time to recover its equilibrium; for, of course, Congress will have untied all the knots in the silver tangle, and money will be easier—to spend.

Who would have thought that silver could have produced such a great disturbance. Nevertheless it is good for something. It is an excellent conductor of electricity. Some of our friends who have not been affected by the existing troubles declare that electricity is a good conductor of silver, from the public purse to the private pocket.

Our old friend, "Constant Reader," writes to say that he has read Mr. Gilley's Paris letter about gasoline carriages, and wants to know if there are any such in this country. We don't know of any; nor of any storage battery carriages, but there has been some experimenting in this direction. If any of our inventive readers have anything new in this line we should be pleased to hear from them.

On another page of this issue we present a portrait of the eminent English electrician and engineer, William H. Preece. Although nearly sixty years of age, he is in his prime as a lecturer, experimenter and inventor. His many additions to electrical science and literature have placed him foremost among those whose energies are always bent towards the benefitting the world from a scientific standpoint.

POP-GUN WARFARE ON THE TROLLEY.

Every now and then we hear the feeble noise made by the editorial pop-gun of the *World* in its futile effort to fire a destructive charge against the trolley system, and we see its garbled accounts of accidents as virulently as ever, headed "One more victim to the ghastly roll," "The death-dealing trolley scores another victim," etc. No matter what has been the real cause of the accident, this brazen iconoclast of decent journalism flaunts the red flag of menace to the trolley system. It matters not to the *World* that the victim of the accident is an infant of two years, allowed by the criminal negligence of its parents to wander and play in the streets. Infants can, when needed, serve for display of venomous and apopletic tirade against the trolley. We read of the lovely golden-haired tot, one moment all life and animation, the next nothing but a bleeding and quivering victim of "the horrible juggernaut," and once more the editorial pop-gun goes off in the Tower of Babel. It is only a wooden gun, and its missile is dirt, so it can do little harm, and the weary readers of such trash have got beyond the possibility of indignation at the palpable injustice done the railway companies.

It is not the trolley which is the cause of accidents; it is simply rapid transit. Electrical propulsion is a means of rapid transit, and whether as overhead trolley, underground trolley, or storage battery, these same accidents are likely to occur, as would be the case whatever the motive power.

The people demand rapid transit, and the *World* has not been inconspicuous in voicing such demand. Now, when it is measurably given, let the *World* shut up.

While on this subject we would suggest that a large percentage of these accidents on our streets, whether traversed by horse cars or trolley cars, can and should be prevented. Let the railway companies procure the passage of a law making it an offense for parents and guardians to allow young children to play outside the curb. Let the limit of age be such as to reasonably insure that the youngsters will realize the danger of approaching the tracks. Let a proper penalty be imposed, and we think there would soon be an end, at least, to such accidents as the killing or maiming of children of two years of age. For such accidents are due to a criminal carelessness of the parents, and should be followed by punishment of the latter.

ELECTRICITY ON ELEVATED STRUCTURES.

The Intramural Railway at the World's Fair is a living instance of what electricity can do on an elevated structure for passenger transportation. The plan is not only feasible, it is *un fait accompli*. Now Brooklyn comes to the front, and reports state that, owing to the competition of the trolley cars, the elevated roads have sustained heavy losses. The remedy that the managers of the road seek is in the introduction of electricity. At last they are beginning to realize that locomotives in a city are a nuisance, and as they wake from their sleep they will rub their eyes and see the electric locomotive rising, phœnix-like, out of the ashes of the steam locomotive.

When, though, will Father Knickerbocker follow the example of our sister city?

Electric heating has come to stay. It has a magnificent future.

LETTERS FROM A LABORATORY. LVIII.

BY JULIAN A. MOSES.

Clerk Maxwell, in his celebrated treatise on the theory of heat, in speaking of the terms used in the sciences, says: "Words of this kind, which express the same things as the words of primitive language, but express them in a way susceptible of accurate numerical statement, are called scientific terms, because they contribute to the growth of science."

Language, as it grows from acquisitions furnished by ever-advancing sciences, becomes studded with words or phrases, which serve to express in as comprehensive and as short a way as possible, certain ideas. Such words are chosen which naturally are suggested to the originator as best adapted to give expression to his thought. Thus complex series of ideas are concentrated in his mind, and very often a single word is sufficient to express that which might take volumes to explain minutely. This is the value of language; and anything that tends to make it more precise and descriptive, adds another advantage to this nearly perfect method of thought communication.

Electricity has furnished its share of words and phrases, but complaints are now being promulgated to the effect that many of the phrases are inaccurate, that while they give correct images and are practically successful, they are theoretically imperfect and should, therefore, be cast aside and have other words, etymologically correct, substituted for them.

Slang is essentially vulgar, but it is oftimes very expressive. All nations are provided with their share, but let us "cast out from among us" all scientific slang; let us have terms which are like units, positive and precise. Not only should words come under this ban; but let us include sentences and cant phrases; in other words, have a simple, straightforward manner of expressing electrical conditions, manipulations and phenomena, free from inaccuracies, and, last but not least, unvariable. Then only will a literature of electricity be formed which can be universal.

That the necessity for this is felt, is apparent to anyone who has continual dealings with matters electrical. We hear of "throwing the switch," when to the uninitiated this means comparatively little. The "blowing of a fuse" is an ordinary occurrence; and so on with many other phrases which are obviously etymologically weak.

Now that a difficulty has been found, some remedy should be offered; if not the remedy, some means towards that end. The change cannot be exactly international; but the alterations may be made in the English speaking countries.

Recently an Englishman was employed by one of the large electrical concerns in this country. His appearance among the other workman was not noticed to any great extent. Soon, however, the American love of ridicule and caricature broke out among the men, and in a short while not only was the Englishman's accent imitated, but his electrical idioms were made the subject of a jest. Many of them were entirely incomprehensible to the Americans, but it was not long before the incongruity of some of their own expressions was noted by some of them, and it became a case of the "pot calling the kettle black."

If, then, the untutored workmen can recognize these deficiencies, why should not the so-called enlightened electrical workers assert their rights to the possession of an unsullied vocabulary?

Let us know whether we can "shut off the current" or "break the circuit." Let us have these idioms either confirmed or abandoned, so that we may feel secure and have a certainty, which can only be obtained by a gradual growth, the outcome of some decisive step in the right direction.

The Electrical Congress, soon to be in session at the World's Fair in Chicago, are to take up the discussion concerning the adoption of units and standards; perhaps it would not be a bad idea for them to set aside a little of their valuable time to a brief consideration of this subject.

CORRESPONDENCE.

Electro-Copper-plating of Ships' Bottoms.

To the Editor of Electrical Review:

In an article in this week's Review, referring to the proposed use of electro-copper-plating for protecting ships' bottoms, you say that "if it could be carried out successfully it would be economical," but doubt if it would pay in the case of ships. By this I suppose you mean you doubt if it could be carried out successfully. As I am the inventor who you say asserts he has discovered a "new plating solution, etc., etc.," a notice of which appeared in the *Iron Age* of June 1, 1893, and in the *Scientific American* of July 8, 1893, I hope you will allow me the space to show why I think iron and steel ships can be successfully copper-plated by the electrolytic method. In the first place it is not intended to plate the entire bottom of a ship at one operation, which, although it could be done, would be an exceedingly costly undertaking. The method to be used is to plate a section or a number of sections of the bottom of the vessel while it is still in the dry-dock, by placing suitably constructed, narrow tanks against the sides, the side of the vessel forming one side of the tank. These sections overlap, and when completed, the extra thickness of copper at the joints is cut off and burnished down, thus making one continuous smooth sheet of copper, which effectually prevents contact of the iron of the hull with the sea water.

The above method has been protected by patents issued to Mr. Thomas S. Crane, M. E., of 800 Broad street, Newark, N. J.

As copper deposited from the usual solutions is not always all that could be wished, being rough and liable to contain pin holes, it is intended to use the solution you refer to. From this solution copper can be deposited quickly, and of a very superior quality. It is entirely free from pin holes and the surface is perfectly smooth.

From data obtained from practical experience in plating the iron work of the tower of the new city hall in Philadelphia, which is by far the largest work ever done in electro-copper-plating, I know that the cost of copper per pound applied by the electrolytic method to ships' bottoms will not greatly exceed the cost of that applied in sheets, if it were possible to apply it in that way, and will certainly be very much cheaper than that applied over a wooden sheathing, when the cost of the wooden sheathing is included.

Some critics have contended that if the vessel was to ground on a sandbar the copper would be torn off, exposing the iron and setting up galvanic action which would quickly corrode the iron, and that this danger, arising from using copper in direct contact with the hull, would outrank any advantages the method might possess. To practical electro-platers the contention is absurd, as they well know that an object, a sheet of steel for instance, when copper-plated even with a thick coat, can be bent and twisted into any shape without the copper being detached.

Of course the copper might be cut off by the ship striking a rock, but it would require very fine judgment on the part of the steersman to strike a rock and only cut off the copper and not injure the hull enough to require dry-docking for repairs.

J. D. Darling.

Frankford, Phila., August 9.

OUR CANADIAN LETTER.

Ottawa, Ont.—The Chaudiere Electric Light Company have decided to erect their new power building at the Chaudiere themselves, and also to install the necessary plant, which will be of 1,200 horse power. The building, plant, etc., will cost about $20,000.

Electricity for Canals.—The electrical apparatus designed by Mr. Thomas Monro, C. E., for operating the lock gates was tried recently at Melocheville on lock No. 4 of the Beauharnois canal. It proved a success, the gates being easily opened and closed in about one minute. This invention will greatly reduce the cost of labor on the canals. J. A. C.

Montreal, August 8.

Electric Railways in France.

There are now several lines in France worked by accumulators and aerial conductors, and the number may be expected to increase rapidly, as several manufacturing companies are entering the field, with plenty of capital and energy. Among the new enterprises is an extension of the line at Clermont-Ferrand. This line, which is worked on the overhead trolley system, extends from the Baths at Royat to Clermont and Chamelieres. At present the generating station is equipped with two engines, one of 150 horse-power and one of 350 horse-power. There are three dynamos. The line will soon be extended from Clermont to Dome; two auxiliary lines are already being added to the principal lines.

Paris has a second accumulator line extending from the Opera through Lafayette street to Maubeuge. The cars resemble those on the Madeline line, which has now been in operation some months, and as both lines are working successfully, there is every reason to believe that electric traction will be rapidly extended on the tramway lines in Paris.

At Havre animal traction is to be entirely superseded by electricity. An arrangement has already been made between the tramway companies and the Thomson-Houston Company for this purpose, and it has been decided to adopt the overhead wire system, as the companies consider the disadvantage of carrying the dead weight necessitated by the accumulator system is greater than that attending the construction of an overhead line. The trolley wire will be of No. O., B.W.G., hard drawn copper, and will be supported by steel transverse wires extending across the streets, and supported in the usual manner, and the line will be worked at a potential of 500 volts. In order to diminish as much as possible the electrical resistance, the two rails which will be used for the return circuit are to be connected with copper wire at intervals of 60 feet. The line will be equipped originally with 20 cars.

A Spanish International Exhibition.

An internationnl exhibition is to be held in the Palace of Arts and Manufactures, Madrid, from the 1st of May to October 31, 1894. The exhibition will be divided into 14 sections, one of which will be devoted to electricity; because of the fact that electric lighting is rapidly gaining in favor in Spain, owing to the high price of gas, and to the fact that continental firms—especially German—are looking well after Spanish orders. This should be a good opportunity for American firms to show the Spaniard what they can do.

Electric Traction in Japan.

The land of the "Rising Sun," and especially the inhabitants of the Kioto district, are taking very kindly to electricity and its varied applications. There has for some time been in operation near Kioto an electric power transmission plant, and we now learn that it is proposed to construct an electric tramway about five miles long in Kioto, in anticipation of the exhibition shortly to be held in commemoration of the 1,100th anniversary of the foundation of the city.

To Visit the Niagara Falls Electric Road.

The special train from New York, for the Electrical Congress, will stop at Niagara Falls. Through the kindness of Mr. W. A. Grant, general manager of the Niagara Falls Park and River Railway, an invitation has been extended to the members and their friends to inspect and take a ride over his electric road on Sunday morning, August 20, before the train proceeds to Chicago. This electric road, operated by Niagara water power, is one of the finest in the world, and for 12 miles runs with all the wonderful scenery of the Niagara Falls and Rapids in full view. It has been arranged so that the excursion can be made with ample leisure on Sunday morning after breakfast. The round trip over the electric road will take about two hours, and special cars will be provided for the party.

Wall Street and the Electrical Stock Market.

There were 106,006 shares of General Electric sold on the New York Stock Exchange last week. The opening price of this stock was 52; its highest for the week, 53¾; lowest, 37½; closing, 45⅜. It was rumored about the middle of the week that some of the company's paper had gone to protest. This was afterwards authoritatively denied. A member of the firm of Drexel, Morgan & Company is reported as follows:

"We have received no information of report of General Electric paper going to protest. We believe this is a revival of the story that was current a few days ago that there would be a receiver.

"We made sacrifices so that the company would not be compelled to go into a receivership. We sold at sacrifice some of the best securities in the company's treasury."

In answer to the question, "Do you think dividend earning capacity of the company will be impaired?" the same authority is reported to have said: "What is the good of talking about dividends with the stock selling at this price."

The $4,000,000 syndicate organized in connection with General Electric has been completed. President Coffin states that "the whole amount of the loan will be taken and details will be made public in the course of a fortnight, through a circular to be issued to stockholders."

Edison Electric Illuminating opened at 87 and closed at 88½. There were only 360 shares sold during the week.

Western Union opened at 77⅛ and closed at 77⅜; 79,894 shares changed hands during the week.

At Boston, American Bell Telephone closed Saturday at 180; Erie Telephone at 37½; New England Telephone at 47½; Westinghouse at 17; General Electric at 45⅜; Fort Wayne at 5.

It is noticed that the bull interest in the New York market finds Western Union the best available leader. The balance of the list follows it up and down; it moves as easy as anything on the list. This is due to the comparatively small amount of floating stock, and to the fact that traders have made money in Western Union both ways. They are, accordingly, ready either to buy or to sell on suggestions.

The exchange market clearly points to the total disappearence of the currency premium at an early date. It is not considered likely that this premium will entirely vanish at once, as there will be a demand for some time from the interior for the purpose of payment of hands. Still, a premium of one-quarter or one-half of one per cent. would do very little harm and would excite no uneasiness after the rate current last week, which was as high as four per cent. at one time.

Matthew Marshall, an able financial writer, says in Monday's *Sun:*

"Had our New York bank presidents been as sagacious and as bold in drawing upon their reserves to pay their depositors as they were in issuing Clearing House certificates for the settlement of balances between themselves, we should have had no hoarding of currency and no premium upon it. But just as the silly talk of our Treasury officials about suspending gold payments as soon as the gold reserve in the Treasury fell below $100,000,000 alarmed timid people into hiding away all the gold they could lay their hands on, so the refusal of the banks to honor in currency checks and drafts upon them has alarmed the public into gathering into its own possession and hiding away all the loose currency it could obtain. There would have been no hoarding of gold if both the retiring Secretary of the Treasury and his successor had, at an early date, announced their determination to maintain gold payments till the last dollar of their gold was exhausted, and, in like manner, if the officers of our banks had made known a fortnight ago their intention to use their entire reserves, if needful, in maintaining currency payments, the hoarding of currency would have been limited to a few ignorant people instead of extending, as it has done, to every one who needed actual money for his business transactions. It will be said that the reserves of the banks were not sufficient to meet the demands which depositors threatened to make upon them, and that the inevitable stoppage of currency payments might better come while the currency was in their possession instead of being paid out to depositors. To this it is enough to answer that a bank is insolvent and liable to be placed in the hands of a receiver whenever it fails to keep its promises to pay its depositors on demand—and it is no less insolvent because it arbitrarily refuses payment from the fear that it will become unable to pay. Besides, it is as near certain as anything can be, that if the banks a fortnight ago had paid out only $50,000,000 of their reserves, they would have so glutted the demand for currency that the run upon them would have ceased and they could have restored the deficiency at their leisure.

Lecture on Electricity at the World's Fair.

The course of lectures arranged by Chief Barrett of the Department of Electricity promise to be a great success. The lectures will be given on Tuesdays, Thursdays and Saturdays of each week by the exhibitors of the department, at the scenic theatre of the Western Electric Company. These addresses will be very interesting, and at the same time give exhibitors an opportunity of explaining their apparatus to the public.

The programme for last week was as follows:

Tuesday—"Electrical Testing Instruments," by C. P. Frey, electrician for E. S. Greeley & Company, New York.

Thursday—"Search Lights," by Fred. W. Tischendoerfer, representative of Schuckert & Company, of Nuremberg, Germany.

Saturday—"Fire Alarm and Police Telegraph," by E. B. Chandler, Western agent of the Gamewell Fire Alarm and Telegraph Company, New York.

The lectures so far this week have attracted much attention, and on account of the limited space hundreds of people have been unable to gain admission, which is evidence of their assured success.

PERSONAL.

Among recent distinguished foreign visitors in New York and the Review office were MM. Mascart and Hospitalier, of France, and Professor Ferraris, of Italy. These gentlemen intend visiting the World's Fair and remaining over for the Electrical Congress.

Mr. Morris W. Meade, Superintendent of the Bureau of Electricity, Pittsburgh, was a New York and Brooklyn visitor last week, talking over municipal electrical affairs with Superintendent Frank C. Mason, of Brooklyn. They found time to enjoy the sea and the beach at Coney Island—an excellent resting spot for tired electrical workers.

Mr. Richard Varley, Jr., has opened an office at 136 Liberty street, New York, and will devote himself to the work of electrical testing of insulated wires and cables. Mr. Varley is a capable and experienced electrician, and has for seven years past been in charge of the testing department of the Okonite Company. He should do a good business in his line of work, in which he is an acknowledged expert.

J. W. Blaisdell, superintendent of the Department of Electricity at the World's Fair, celebrated his fiftieth birthday on Saturday, August 5. The occasion was made a pleasant one by his friends among the exhibitors in the building, who accepted the opportunity and presented Mr. Blaisdell with $100 as a token of their esteem and respect. Many speeches were made by those in attendance, to which Mr. Blaisdell responded with much feeling, in his always polite and modest way.

Dr. Gustav Bissing, principal examiner in the Electrical Division of the U. S. Patent Office, sailed on Saturday, August 12, in "La Champagne" for Havre. He will spend two or three months traveling in Europe, and will take occasion to examine and study the patent systems of that country, especially those of Germany and Switzerland. During the past four months many officials of foreign patent offices have visited Washington, and Dr. Bissing, who speaks French and German fluently, has been assigned by the commissioner to the duty of entertaining them. His present trip is in the nature of a return visit, and he will doubtless receive every facility which the foreigners can give him.

Edison Illuminating Companies.

REPORT OF THE PROCEEDINGS AT CHICAGO—BOSTON THE NEXT MEETING PLACE.

The ninth annual meeting of the association of Edison Illuminating Companies convened at the Wisconsin State Building at the World's Fair Grounds, at 2 o'clock P. M. Tuesday, August 8.

The following representatives were present:

General Electric Company—S. Dana Greene, assistant general manager; F. P. Fish, legal department; A. E. Kennelly, consulting electrician, Edison laboratory; A. D. Page, F. E. Jackson, Wilson S. Howell, John W. Howell, lamp department; Chas. B. Davis, assistant manager lighting department; W. J. Jenks, patent department; Albert B. Herrick, electrician, Schenectady works.

Edison Electric Illuminating Company, of New York—James W. Pryor, secretary.

Harrisburg (Pa.) Electric Company—John I. Beggs.

Renovo Edison Light, Heat and Power Company—J. H. Sheddy, general manager.

Edison Electric Light and Power Company, Little Rock, Ark.—G. H. Van Etten, president; J. A. Van Etten, manager; Leigh Carroll, stockholder.

Edison Illuminating Company, Detroit, Mich—C. P. Gilbert, secretary and manager; Hoyt Post, director and attorney.

Edison Electric Illuminating Company, of Boston, Mass.—C. L. Edgar, general manager; J. Otis Wardwell, counsel and clerk; L. Stieringer, stockholder.

Edison Light Company, Grand Rapids, Mich.—A. F. Walker, superintendent; Daniel McCoy, president.

Appleton Edison Electric Company—A. L. Smith, president.

Scranton Illuminating, Heat and Power Company, Scranton, Pa.—Jas. P. Dickinson, vice-president; Fred. C. Hand, secretary; J. E. Parrish, superintendent.

Edison Electric Light and Power Company, St. Paul, Minn.—Geo. H. Finn, secretary, treasurer and manager.

Forest City Electric Light and Power Company, Rockford, Ill.—M. A. Beal, secretary, treasurer and director.

Elgin City Railway Company, Elgin, Ill.—Chr. Wustenfeld, manager.

Edison Electric Company, of New Orleans, La.—E. L. Bemiss, general manager.

Columbus Light and Power Company, Columbus, O.—C. H. Lindenberg, director; A. W. Field, secretary and manager.

Edison Electric Light and Power Company, of Kansas City, Mo.—E. R. Weeks, general manager.

Des Moines Edison Light Company, of Des Moines, Ia.—J. A. Colby, general manager.

Reports were made by the following committees: Executive committee, on the admission of new members; committee on lightning protection, by A. E. Kennelly, chairman; committee on grounding the neutral wire; committee on prevention of damage from crosses with high tension circuits.

Addresses were made on the condition of the patent litigation and other matters concerning the relations of the illuminating companies and the General Electric Company by Messrs. S. D. Greene and F. P. Fish. Discussion on these subjects was participated in by numerous members.

By request of the association, Mr. Luther Stieringer read a paper of great interest, entitled "Electrical Engineering at the Fair—What to See and How to See it."

Captain William Brophy, electrical inspector of the Industrial Mutual Insurance Company, of Boston, was invited to address the association on "Central Station Fire Insurance," and gave a detailed account of past fire losses in electric light and power stations, and suggestions as to the prevention of such losses in future.

Mr. F. E. Barker, chairman of the Board of Gas and Electric Light Commissioners, of Massachusetts, was invited to explain to the association the organization and the results of the work of the board in the exercise of its extraordinary powers. His address was very clear and instructive, and was followed by an animated discussion of the great desirability of securing such legislation as to introduce the same method of control in other States.

The association having received an invitation to take a ride in the electric launches at 8 P. M., and a ride on the Ferris Wheel at 9.30, adjournment was made to ten o'clock Wednesday morning.

The second session of the Association of Edison Illuminating Companies was held in the Wisconsin Building, on the World's Fair Grounds, on Wednesday, August 9, at 10 o'clock A. M.

Mr. A. B. Herrick read a very practical and important paper, illustrated by numerous diagrams, on "The Central Station Switchboard and Its Adaptation to Different Modes of Distributing Potentials."

Prof. A. E. Kennelly, of the Edison laboratory, read a paper, which elaborates still further his very comprehensive paper first read before the Association at the Niagara Falls meeting in 1889, on "The Heating of Electrical Conductors," which has become a classic in electrical literature. The present paper is entitled "The Heating of Cables in Air, Water and Soil."

Mr. C. E. Carpenter was invited to exhibit and explain the peculiar construction of some patterns of rheostats which have recently been adopted by the General Electric Company. The discussion on this subject was unusually interesting, and was participated in by S. D. Greene, Captain Brophy, and others.

At the third session, commencing at 2 P.M., Mr. W. S. Barstow, of Brooklyn, N. Y., submitted a paper on "Description and Test of the Third District Station of the Edison Electric Illuminating Company of Brooklyn."

The election of officers for the ensuing year resulted in the choice of the following gentlemen: C. L. Edgar, president; G. H. Finn, vice-president; W. S. Barstow, secretary; Wilson S. Howell, treasurer. Executive Committee—John I. Beggs, chairman; F. P. Gilbert, E. R. Weeks, William D. Marks, J. W. Pryor, C. L. Edgar (*ex officio*).

The retiring officers were thanked by vote of the Association.

The next meeting of the Association, in August, 1894, will be held in Boston.

The thanks of the Association were tendered to the Wisconsin State Commissioners for the use of the convention hall; to Mr. A. L. Smith, of Appleton, Wis., for his personal interest and effort; to the Ferris Wheel Company, the Ice Road Company and the General Electric Company for the entertainment afforded the delegates.

The secretary was instructed to prepare and incorporate in the minutes a resumé of the laws of Massachusetts creating the Board of Gas and Electric Light Commissioners, and a statement of the work accomplished by them, as suggestive of favorable features applicable to other States.

The association adjourned about 4 o'clock to meet in Boston on the econd Tuesday in August of next year.

The Largest Search-Light in the World.

To America belongs the honor of constructing the largest and most powerful electric search-light in the world, now being set up at the World's Fair. Some idea of its size may be gained by the comparison made between it and the men of ordinary height standing by it, shown in the illustration from a photograph taken when the search-light stood on the roof of the factory. It stands about 10 feet 6 inches high to the upper side of the ventilator on the top of the drum, and the total weight is about 6,000 pounds, but so perfectly is it mounted and balanced that a child can move it in any direction. It was built by the General Electric Company. The reflecting lens mirror used in this projector is 150 centimeters, or 60 inches, in diameter. It is a concave spherical mirror of the Mangin type, free from spherical aberration, reflecting a sensibly parallel beam of light. It was manufactured especially for this projector in Paris, France, and is a most perfect specimen of optical work, three and one-fourth inches thick at the edges and one-sixteenth of an inch thick at the center, and weighs about 800 pounds. The metal ring in which it is mounted weighs about 750 pounds, and the total lens, ring and cover weigh about 1,600 pounds. This great mirror is mounted at one end of the big drum, the outer end of which is furnished with a door consisting of a metal rim in which are fixed a number of plate glass strips five-sixteenths of an inch thick by six inches wide. Inside this drum and sliding upon ways arranged on the bottom, is placed the electric lamp, the source of the light which is reflected by the mirror. It is entirely automatic in its action, is six feet high and weighs about 400 pounds. The carbons used are also made especially for it. The upper or positive carbon is one and one-half inches in diameter and twenty-two and one-half inches long, with a five-sixteenths of an inch core of soft carbon running from end to end through its center. The lower or negative carbon is one and one-fourth inches in diameter, is 15 inches long, and also has a core of soft carbon running through its center. In addition its outer surface is heavily coated with copper. The positive carbon is set a little in front of the negative, and thus almost all the intense light of the incandescent crater is cast upon the reflector. The maximum current at which this lamp operates is 200 amperes, and at this current the lamp has a luminous intensity of about 90,000 to 100,000 candles, the reflected beam a total luminous intensity of about 375,000,000 candles, an intensity which the eye cannot appreciate. In looking at the side of the beam the spectator only distinguishes a stream of light of comparatively low intensity, but in looking at the beam directly its brilliancy is fully seen and the effect is absolutely blinding. Ventilators at the top and sides allow a constant current of air to pass through the drum and dissipate the heat generated by the arc lamp; and they are so arranged that no light can escape through them. All the connections for adjusting the positions of the carbons and the lamp are brought through the drum to the outside, and are arranged in close proximity to one another at one side so that all may be manipulated by the operator without moving from his position. Through openings in the drum covered by densely colored glass the operation of the lamp may be watched and its adjustments verified. The drum is supported by trunions in bearings at the top of a Y-shaped fork, set in a base plate, and the whole is supported on a system of friction wheels, forming a turntable resting upon the top of a massive pedestal supporting the whole structure. The drum, fork and base plate may be rotated horizontally on the turntable either by hand or by gearing provided for this purpose. The drum may also be elevated or depressed in a vertical plane by similar gearing.

FIG. 1.—GENERAL ELECTRIC COMPANY'S NEW ELECTRIC SEARCH-LIGHT—SHOWING MAN INSIDE.

Before the projector was sent to the World's Fair a public test was made at Middletown, Conn., at the works of the Schuyler Electric Company, where it was built. From the roof of the works the great white beam of light shot forth into the obscurity of the night, and slowly swept the country side for miles around, bringing every object upon which it was directed into brilliant and distinct relief. It illuminated the roofs of distant villages and scared their inhabitants, and lighted up the sign boards miles away, so that they could easily be read by means of a glass. The projector was turned upward towards the sky, and the beam, like a supernatural divine finger, wrote words upon the clouds—messages of light to the starry populations. It was a majestic manifestation of man's invasion of the realm of Phœbus.

It was observed that the space within the beam was violently agitated, and closer observation revealed the fact that millions of moths and minute insects were hovering in it, attracted by the brilliancy of the light. Next morning bushels of dead moths, beetles, other insects, and some small birds, were swept up from the roof on which the projector stood. They had been killed by the intensity of the light.

How far the powerful beam of light of this instrument can be seen is difficult to state. The search-light set up by the General Electric Company, on Mt. Washington, in the White Mountains, has a diameter of only thirty inches, and a reflected light from the mirror of about 100,000 candle power, yet the newspaper can be read in its beam ten miles away, and the light can be seen from points 100 miles away. How much farther then could this 375,000,000 candle-power light be seen in a clear atmosphere, free from moisture, if the projector could be mounted upon an eminence sufficiently high to clear all surrrounding obstacles?

TELEPHONE TALKS.

Bay City, Mich., is now connected by long distance telephone with Cleveland, O.

At Atlanta, Ga., the telephone exchange was damaged by fire to the extent of $25,000 loss.

The Lake Shore Railroad is arranging to introduce long distance telephone service on its lines.

The New England Telephone and Telegraph Company are running a new wire to Worcester from Boston, Mass.

The directors of the Erie Telegraph and Telephone Company have voted to declare a dividend of $48,000, to be paid on August 14 to stockholders on record Saturday noon, August 5. This is the thirty-ninth dividend of the company. The statement is as follows:

The Cleveland Telephone Company, the Northwestern Telephone Exchange Company and the Southwestern Telegraph and Telephone Company report for the three months ending June 30, 1893, a

Gross income of	$251,501 35
Gross expenses (including dividends paid)	246,450 03
Surplus	$5,051 32

SUBSCRIBERS.

Number connected March 31, 1893	15,856
Added during the quarter	152
Total number connected June 30, 1893	15,508
Proportion of dividends received by the Erie Telephone and Telegraph Company	$59.630 00
Dividend No. 39	48,000 00
Surplus	$11,630 00
Total surplus for the three months	$16,681 35

Some Interesting Installations.

ELECTRIC LIGHT AT THE NORTH POLE—AN INTERVIEW WITH AN OFFICIAL OF THE CASE ENGINE COMPANY BRINGS OUT SOME INTERESTING NEWS.

The manufacturers of the Case engine, New Britain, Conn., claim for their engine a wider diversity of uses than that of any other steam motor, and the way their business has kept up, notwithstanding the business depression, is strong substantiation of this claim.

Mr. Wm. S. Hine, general sales agent of the Case Engine Company, was recently interviewed by a REVIEWITE, and found to be in quite a joyous mood over the Case Company's business. The month of July was one of the best months in the business of the company. On being asked to specify some of the interesting points of his work, Mr. Hine said:

"To start with, we have recently sent an engine to the North Pole with Lieut. Peary. This engine was sold by our Philadelphia agents, Messrs. J. W. Parker & Company, and is to be used for driving a dynamo to furnish light for the Peary party during the long Arctic night.

"Reading in the New York *Sun* of the accident to Royal Phelps Carroll's yacht 'Navahoe,' I notice that assistance was given her, after the disaster to her mainsail, by the Massachusetts schoolship 'Enterprise.' We have a Case engine on board the 'Enterprise' helping to keep her cool, which no doubt accounts for the cool-headedness of the sailors in this emergency. The famous whaleback steamer 'Pillsbury,' which was the pioneer of her class, and her sister ship 'Washburn' both have Case engines connected to multipolar dynamos. The dynamo aboard the passenger steamer 'Nyack,' running from Buffalo to the World's Fair, is driven by a Case engine.

"At A. Terry & Company's, Terryville, Conn., where the liquid fuel system is used for annealing iron castings, a Case engine drives the oil pump and air compressor. This machine has been running two years without any adjustment, only stopping five minutes a week to oil. The time in operation is about 18,000 hours, or the equivalent of six years ordinary running. An interesting feature in this installation is that this engine pumps the oil for the boiler which furnishes it steam, or blows its own fire as well as its own 'horn.'

"One novel use of the machine is in Danbury, Conn., where one of our hanger engines is suspended in the gable of a dye-house coupled direct with exhaust fan to remove the steam from the vat.

"There are ten of our smallest sized engines in use on the interlocking system of the Chicago and Northwestern Railroad in Chicago, plants being installed by the Union Switch and Signal Company, each plant consisting of engine and small dynamo, doing away with a vast number of gravity cells formerly employed to generate the current to actuate electro-pneumatic switches. Compressed air was available at the engines to run them in lieu of steam, but one obstacle which presented itself was the freezing of the exhaust ports. This was ingeniously overcome by inserting a coil of fine wire in the induction pipe, which becomes heated to incandescence by the passage of the electric current, and which heats the air before it enters the engine, prevents the freezing and also gives the engine an increased efficiency.

"Among other recent installations are plants in the Society for Savings Building, Cleveland, O.; the Cuyahoga Building, Cleveland, O., and the new telephone building, Detroit, Mich.; also on steamers 'City of Alpena,' of the Detroit and Cleveland Navigation Company; 'Columbia,' running on the St. Lawrence river; 'Pocahontas,' of the Virginia Navigation Company; 'Nutmeg State,' of the New York and Bridgeport line, and Joseph Pulitzer's yacht 'Romola.'"

The Westinghouse Conduit System.

HIGH POTENTIAL ALTERNATING CURRENTS FOR ELECTRIC STREET RAILWAYS.

The electrolytic action of the return currents on water and gas pipes has attracted considerable attention among many of the

FIG. 2.—ARC LAMP USED IN THE HUGE PROJECTOR.

brilliant lights of the electrical fraternity. Mr. George Westinghouse, Jr., has taken the matter in hand with a view to an improvement and a remedying of the evil, and has produced a conduit system, employing high potential alternating currents instead of the heavy continuous currents now in use. Briefly, the system is this: A pair of high tension lines will be laid along the line, and the current will be reduced to a safe working pressure by converters and fed into short sections of the railway conduit, so that, in the first place, there will be no traveling of the current over long distances, and, secondly, the current being of the alternating character, will not produce the electrolytic action which seems to be the occasion of destruction to iron and lead pipes.

Negotiations have already been opened with one of the large Eastern railways for the substitution of electricity for horses, and it is expected that as soon as experiments now being made are completed, and prove satisfactory, these lines will be equipped. The dislike which the city fathers, boards of aldermen, and other officials in small towns have to the trolley will not be transferred to subway conduit systems, which, although more expensive at the beginning, will by the added safety, prove of greater value to the timid public.

It is fortunate for Pittsburgh that the underground system, which has been so much sought after, should have been developed there, for a new field will be opened, which must add very largely to the output of local companies. W. L. Elkins, Jr., president of the Penn Iron Works Company, of Philadelphia, which is engaged in constructing machinery for cable roads, is now in Pittsburgh going carefully into the details of the new plans.

The Sprague Electric Elevator.

The Sprague Electric Elevator Company, now at 120 W. 30th street, have found that their constantly increasing business demands their seeking new and larger quarters. In a short while they expect to move into their new shops at Watsissing, N. J., where better accommodations await them. The machine shop measures 100 x 250 feet. Their works in this city will be used as repairing shops. A large plant of six elevators, soon to be installed in the Postal Telegraph Building at Broadway and Murray street, is the most important electric elevator installation yet awarded to any firm. This company succeeded in obtaining the contract, and it will not be long before the plant will be finished and put in position.

FIG. 3.—GENERAL ELECTRIC COMPANY'S SEARCH-LIGHT, SHOWING RELATIVE SIZE WITH MAN AT SIDE.

Power from Niagara.

The Cataract Electric Company, of Rochester, stated in a communication to the executive board that it would like to reserve the use of six ducts in the electric subway for the introduction of power from Niagara Falls. The matter was referred to City Electrician Barnes.

Struck by Lightning.

BY CHARLES K. ALLEN, IN "KATE FIELD'S WASHINGTON."

"Come out here—this is beautiful! You don't get half a view of it from inside the house."

The time was eleven P. M. The scene was a summer boarding house on a mountain top in the Berkshires. The speaker was Mr. G ———, a gray-haired man who was seated on the broad piazza, well sheltered from the wet, while a storm was in progress that had so terrified the whole population of the house as to keep all of them out of bed in spite of the late hour. The lightning came in flashes of blinding vividness, and the crashes of thunder that followed almost split our ears.

"Thank you," I called in response, "I am very well satisfied in here. You are welcome to the nearer and more perfect view." And I continued to hug my chimney corner and endeavored to bury my attention in a book.

"What's the matter? It is dry where I am sitting."

"I dare say. You are an electrician, and don't mind such things. To tell you the truth, I have no fancy for being struck by lightning—that's all."

The old man laughed. "You couldn't find a safer place than right here beside me," said he.

"Why?"

"Because lightning never strikes twice in the same place, and I've been struck once."

This was too much of a temptation to resist. Upon his promise to tell me the story, I went out and shared his society for the rest of the storm.

"It was when I was about 25 years old," he began, "and telegraphy, as we know it, was in its infancy. There was no great Western Union system spanning the continent, but dozens of little lines were in use here, there and everywhere. I wanted to learn the art, having a taste for electricity, and being at the time engaged in experiments to perfect a system of insulation more adapted to the needs of the telegraph than any then known. I was poor; my collegiate course had eaten up what little money my father had left me, and the experiments I was making were too costly for my purse; but I felt that if I could only keep in food, clothing, and shelter long enough to carry through the work I was engaged in, there was a competency in store for me. To get employment in connection with the telegraph, where I could make applications of my discoveries in a small way, was the height of my desire for the present.

"One day I learned that a number of New York business men, chiefly bankers and brokers, had resolved to run a line from the city to New Rochelle, so as to connect their dwellings in that suburb with their offices in town, and enable them, if at home, to be advised instanter of any information of importance. The cost of putting up the wires was considerable, however, and they were looking for someone to take care of the New Rochelle office who would not charge very much for his services. I saw my chance at once, and volunteered to take the place at a modest salary if they would hire some experienced telegrapher to instruct me in the alphabet and signs. The bargain was struck; I obtained my rudimentary lessons for nothing, and in the course of a month was duly installed at the key.

"All went well until one hot summer afternoon—such a one as this was a few hours ago—when heavy clouds gathered in the sky and a greenish hue pervaded the atmosphere. In those days so little was known of insulating processes that no operator ever attempted to stay at his key when a thunderstorm came up. This one approached slowly, and I was warned of it also by a hasty dispatch from the New York man: 'Storm coming. Shall close till it is over.' I, therefore, gathered up some of my papers and started to go into another room in the building till the storm had spent itself. As I was about locking my office door, I was addressed by one of the most

beautiful women I ever saw. She was apparently about 20 years of age. Her large, lustrous eyes were full of tears and her voice was broken as she spoke.

"'Oh, sir,' she cried, 'you are not going away? I want to send a message.'

"'I am sorry, madam,' I answered, 'but there is a storm approaching and I am compelled to leave my instrument.'

"'But this is a matter of life and death. I must get word to New York at once.'

"'That will be impossible, for the New York operator has left his end of the line, too.'

"'Is there not some signal by which you can call him back?'

"'He would not respond if I tried it. He would be afraid to sit with his hand on the key while the lightning played so close.'

"'But the storm may be over in New York before this. Won't you make the effort to call him—for my sake?'

"And then she poured forth her story. Her brother was dying, and she was alone with him and the servants at their home in the village. Unless she could get word to their father, who was in the city, neither he nor their mother would be able to see the young man alive.

"I tried to explain to her what a risk it meant for me, but—well, I was younger then than now! A look into those pleading, tear-filled eyes was too much, and I broke down in the midst of my argument. I believe I would have gone to the stake for her if she had asked me in that way. Back I went. The storm had broken meanwhile, and the thunder crashed as it does now, while the lightning seemed almost to dance in at the window. I called New York. In a moment I received my return signal. The trouble there was over, and the operator was no longer fearful of sitting at his place. I got off my message. Just as I made the last stroke of the signature the whole room turned a brilliant blue. I felt nothing. I had no time to think. I was simply blotted out of existence with this last impression on my senses of the intensity of the color all around me.

"I have no idea how long a time elapsed before I began to notice anything again. When I did, I found myself on the floor of my office, my head in a woman's lap, and two or three men and a neighboring physician standing over me. I looked up to see who was holding me and applying a wet handkerchief to my temples. It was the lovely stranger. I concluded I must be in a dream, and closed my eyes again so as not to dispel it. Then I learned from the conversation what had happened, and in order to reassure everybody I opened my eyes once more and spoke. The girl's tears had all gone. She was full of pitying interest in my case. As soon as I could command my memory of events sufficiently, I bade her leave me and return to her brother's side. She stayed till I rose voluntarily and proved that, though bewildered, I was out of danger. Then she exchanged a few words to the physician in a low tone and disappeared.

"The next morning I received, by mail, a check for one hundred dollars from a gentleman bearing the same surname as herself, who said that I had shown a degree of heroism, in befriending his daughter in her necessity, which was out of the common; he hoped I would allow him to pay the fee for the telegraph message, which he begged to enclose, as his daughter, in her anxiety, had omitted to settle her bill. This made me pretty indignant and I wrote him a somewhat curt letter, deducting the amount which was the regular charge for the message and enclosing him a receipt for that, and bank notes and silver for the balance of the amount covered by the check. I carried the letter around in my pocket for two days, and then decided to mail it just as it was. I heard nothing from the affair again for nearly a week. Meanwhile, there was a funeral in the village, which I ascertained to be that of the young man who had been so desperately ill. Then I felt sorry that I had been so severe with the father, who probably had meant well, and who must have been so overwhelmed with sorrow at the time he received my note that its tone would seem doubly harsh. So down I sat again and jotted off another note, in which I expressed regret for the style of my first, saying that I had written it in forgetfulness of the sorrow overhanging the family, and explaining that I could not accept a gift for a voluntary act of duty.

"Two days later I received a call from my divinity. She seemed just a little embarrassed at first, but after a few minutes' conversation drew from her pocket my two notes. The seal of neither had been broken. 'Father has been away ever since my brother's funeral,' said she, 'and these letters have lain unopened, awaiting his return. This morning it occurred to me that they might be about some matter of pressing importance, and that I had better see if you wanted us to forward them.'

"'I am much obliged for your thoughtfulness,' I answered, 'but how did you know they were from me?' The next moment I would have given the world to recall that question. The quick rush of blood to her face was painful to witness.

"'I had seen a scrap of your handwriting,' she replied, simply, 'and thought I recognized it on the envelopes.'

"'You were right,' said I, 'I wrote both letters. As the second one was written to make amends for the first, there is no need of sending either of them to your father, if you are willing that I should open them.' I tore away the envelope of my first letter, and the money dropped into my lap. 'Your father,' I exclaimed, 'was kind enough to send me a check for one hundred dollars, to compensate me for the trifling assistance I was able to render you a few days ago. Acting on my first impulse, I deducted the cost of your message and wrote him a rather snappish note enclosing the balance.'

"She had listened with evident interest. There was a strange expression in her face as she inquired after my brief pause: 'And your second letter was to say that you had reconsidered——?'

"'Oh, heavens! No,' I cried, perceiving for the first time what an interpretation my words might fairly be given. 'I simply could not bear to pain your father by the sharpness of my words, when I came to realize fully that he had acted from kindly motives, and to remember the load of sorrow he was laboring under.' I tore off the second envelope and handed her the note. She took it and ran her eyes over the few lines it contained. She did not hand it back, but retained it as if unconsciously in her hand.

"'You are very considerate,' said she, 'and I thank you. My father meant well. He did not understand, as I did, that the debt we owed you was one which no gift could repay. I will return the money, if you wish, or perhaps it would be better for you to keep it till you can give it to him in person. I will pave the way for your interview by telling him how you feel about it.'"

"Another fortnight elapsed without event. Then one day the door of my office was opened by a tall, fine looking gentleman who called me by name and introduced himself. It was the father of my lovely visitor. I remembered his face, now that I saw it, and for the first time, associating name and personality, recognized him as one of the leading stockholders in our little telegraph line. He was a banker of some prominence on Wall street.

"'I owe you an apology,' said he, coming to the point at once, 'for doing in an hour of suffering what, if I had my mind completely at command, I should not have thought of doing. My daughter has told me how you feel, and I respect your delicacy. I am now on my way to the city, and shall stay there over night to attend a meeting of one of the corporations in which I am interested; otherwise I should like to see you at the house this evening to talk over your work here and what it holds for your future. As to-night won't do, we must say Sunday. Come up in the afternoon. You must let me discuss your plans frankly with you. As an older man, and one who has made his own way up in the world, I can doubtless give you some advice that will be worth your consideration.'

"I thanked him warmly, and, though much astonished and delighted, did not forget to hand him back his money. He glanced it over to see whether the amount agreed with what I had stated, and put it carefully away in his purse without any further words. On Sunday I kept my engagement. I found the banker alone in his library, and we had a candid chat, in which I told him of my love of electrical experimentation, and of the way I had contrived to get my present position for the sake of the practice and the opportunity it would give me to study out a few problems which were vexing the minds of practical electricians. He heard me through, asked me a good many questions and wound up with:

"'Then you think the greatest need of telegraphy to-day is a better method of insulation?'

"'That is it,' said I.

"'And you think you are on the track of a discovery in that line which may amount to something?'

"'I think the discovery is already made. It simply needs perfecting.'

"'And you are sure there is money in it? You see you have stirred up all the financier in me,' he added, laughing.

"'It will make somebody's fortune.'

"'How long will it take to develop?'

"'That depends on the obstacles in the way. It costs money to carry such things through.'

"Soon a maid-servant stopped at the door to announce tea. I was invited to stay, and accepted gladly. It gave me a chance to see the divinity again. Incidentally, I had a chance to meet her mother and make a general estimate of what kind of a woman the girl would grow into.

"'I am going into a fresh venture," the banker announced at the table after a little while. 'Mr. G—— has interested me so much in his plans for developing a new method of insulation that I am resolved to organize a stock company to supply the means for perfecting his discoveries, and pocketing the profits. He is going to be the superintendent, I am to be treasurer and you, my dear, had better prepare to accept the presidency.' He looked across the table at his daughter as he spoke. 'I have always believed in bringing women up to some knowledge of business. In what manner could you be broken in more agreeably than as president of the G—— Electric Insulator Company?'

"I supposed he was jesting, but he was not. Early in the week he came into my office and went over the ground of my discovery again with me. The company was formed. I was appointed superintendent at a good salary, which would enable me to resign my place as operator and devote my entire attention to getting out my patents. I had many visits to make to the treasurer's home, and usually met the president there. The fact of her sex was not revealed to the world, even in the company's published reports, as we used simply her initials. When we came to get out a corporate seal, the president insisted upon a picture of a lightning flash and a man falling under it.

"'It's not a pleasant thing to look back upon,' said she, 'but that adventure of yours was what brought us all together and gave birth to the company; and it was for the purpose of insuring other operators against such a risk as you ran for my sake that father became interested in your investigations. I don't believe you realize yet what a narrow escape you had that day.'

"'Indeed I do,' I replied. 'But how could anyone with a man's heart in him refuse such a request as you made of me then, even though he knew that the lightning would strike him the next moment?'

"'At any rate,' she went on, not seeming to heed my remark, 'you have no idea what I suffered till I saw your eyes open and heard you speak again. It seemed hours before I could make anyone answer my cries after I saw you fall from your chair. I felt as if I had murdered you, and every thought fled from my mind except the one horror of having caused your death. You never felt any after effects from the stroke?'

"'Nothing beyond the loss of a handkerchief. Curiously enough, one of the first things I looked for after coming to myself was that. I had had it in my hands only a moment before I lost consciousness. I have sometimes wondered whether it was consumed, for I could find no traces of it.'

"My companion did not answer at once. When I looked at her face it wore a crimson flush such as I had seen there only once or twice before.

"'I am accountable for your mysterious loss,' said she. 'I snatched up the handkerchief to bathe your temples with, and unconsciously carried it off. When I discovered that I had it, I took the liberty of keeping it as a souvenir of the most startling episode in my life. It bore your name in the corner—I remember it was in your own handwriting.'

"'Then that was the way you identified my hand in the superscription of those letters to your father?'

"'That was the way.'

"'And was there such a strong resemblance between my linen marking and my letter writing that you were not afraid to turn over your father's correspondence to a stranger on the strength of it?'

"'Oh, somehow, I was not afraid to trust you. But judge for yourself.'

"She drew from the little desk at which she was sitting a large official envelope, marked 'Documents connected with the organization of the G—— Electrical Insulator Company,' and took out of it a handkerchief and a note. 'You see,' she remarked, roguishly, 'I have learned a good rule of business and preserve my documentary proofs of everything.'

"Well, to make a long story short, the company succeeded beyond all our expectations. My patent insulator did not itself prove perfection, as we had hoped, but it secured priority for a principle which everybody who made insulators was compelled to employ, and the company earned a large annual revenue for many years from royalties, without the necessity of manufacturing a dollar's worth of material for the market. My researches into the matter of insulation led to other discoveries, all of which I turned to account for the company. It was a family concern, you know, and was kept a close corporation."

The thunder had become very faint, the roar of the storm had been lulled into the soft patter of a gentle rain, and the lightning made only faint flashes so low against the horizon as to look rather like reflections from some disturbance of the elements behind the mountain crest than any original show got up for our benefit. A woman's head was put out of the window back of where we sat. It was gray-haired, like my companion's. A sweet voice said:

"Don't you think, dear, it is time to come in? Everyone either has gone to bed or is going, and I am sure you have kept Mr. Allen up too long already. What protracted tale has he been telling you, Mr. Allen?"

"He has been giving me the history of how he was struck by lightning," I answered; "and it is not often one has the privilege of meeting a man who has been through such an experience ——"

"And lived to tell the tale? True. But you ought to label me also among your curiosities; for I don't believe you have often met a woman who was president of an electric insulator company at twenty-one, have you?"

The Westinghouse Company.

The Westinghouse Electric Company is now running with about 1,000 men in its factories, taking care of pressing orders. The company has four months' full orders on hand and will add to its force as the financial situation warrants. Mr. Westinghouse says: "Our policy has been conservative and the company's affairs are therefore in excellent shape considering the times."

ADVANCE INFORMATION.

New Electric Companies Formed and Important Constructions Projected.

VALUABLE INFORMATION FOR MANUFACTURERS AND DEALERS.

We publish below the earliest information obtainable relating to new electric railways, new electric light companies and projected electric construction of all kinds. Every reader will find these columns of special interest, and manufacturers and supply houses will receive many valuable suggestions looking to new business by carefully watching this department in the ELECTRICAL REVIEW from week to week.

New Electric Railways.

BROOKLYN, N. Y.—The Brooklyn, Bath and West End Railroad Company has increased its capital from $600,000 to $1,000,000. The company proposes to substitute electricity for steam power, and the work has been in progress for several months.

ATCHISON, KAN.—The Atchison Railway and Electric Company; capital, $350,000. Incorporators, J. C. Fox, J. Harris, B. P. Waggoner and A. W. Simpson, of Atchison, and Edward Morton, of New York city.

CHESTER, PA.—No fewer than five electric railway companies are now asking for privileges in Chester. Nearly every street in the city is on the plan of one or the other of these corporations.

MONTGOMERY, ALA.—The Cloverdale Electric Company and the Montgomery Terminal Railway Company have been consolidated, and the capital increased to $350,000. Electricity will be substituted for mules on the Terminal Company's lines.

KANSAS CITY, MO.—An ordinance granting the holders of the franchise of the Prospect avenue horse car line permission to change its power, has been filed with the city clerk.

TULLYTOWN, PA.—Right of way for a trolley road has been granted through Tullytown.

CINCINNATI, O.—The county commissioners have been petitioned to grant a franchise for the construction of an electric street railway between Cincinnati and Oakley.

WORCESTER, MASS.—The railroad commissioners have authorized the Worcester and Millbury Street Railway Company to increase its capital stock from $150,000 to $270,000.

GARDNER, MASS.—The Gardner Electric Street Railway Company has been granted a franchise to build an electric railway between the several towns and villages.

PHILADELPHIA, PA.—The speedy completion of the great work of the traction company in trolleying all of its lines is assured by the announcement that a number of banks and trust companies have formed a syndicate that will advance the $2,000,000 needed for the work.

WEST CHESTER, PA.—The Suburban Railway Company; capital, $400,000. Incorporators, William Jenks Fell, of Philadelphia; Francis Fennimore, of St. David's; M. M. Childs, of Wilmington, Del., and William S. Kirk, of West Chester. The company will build a trolley line, 65 miles long, through West Chester to Philadelphia.

ASHLAND, MASS.—The Natick, Mass., Electric Railway Company will be granted a franchise by this town.

YOUNGSTOWN, O.—The Youngstown and Canfield Street Railway Company and the capitalists interested in the project to construct an electric line to Lanterman's Falls, have consolidated and pooled issues, and the reorganized company will build a through line to Canfield, covering the proposed routes of both companies. Among those interested are J. W. Canfield, S. O. Ewing, Alexander Dickson and J. R. Johnston.

REDKEY, IND.—A franchise for an electric railway to connect Dunkirk and Redkey has been granted.

LYNCHBURG, VA.—The Rivermont electric road has been sold to a syndicate which includes John P. Pettyjohn.

SAN FRANCISCO, CAL.—The Pacific Underground Electric Railway Company; capital, $100,000. Directors, J. J. Scrivner, A. Craig, F. S. Chadbourne, D. B. Richards and John F. Burgin. The purposes of the company are to purchase, own and sell patented electric devices for operating railway systems wherein the electricity is carried underground.

SPRINGFIELD, O.—A. W. Neff, of Cincinnati, representing the company which proposes to build an electric line from Xenia to Springfield, has petitioned the county commissioners for right of way.

Electric Light and Power.

BIDDEFORD, ME.—The managers of the York Light and Heat Company are negotiating with the directors of the Biddeford and Saco Railroad Company for a combine, with a view to extending the electric street railway. A large new power station will be built.

TUCSON, ARIZ.—The Tucson Water, Electric Light and Power Company, capital $50,000, has been incorporated under the laws of Kansas. The directors are Sylvester Watts, of St. Louis, Mo.; Henry A. Lawton, T. Parker and Jas. W. Parker, of Atchison, Kan.

WACO, TEX.—The directors of the Waco Gas and Electric Light Company have determined to rebuild the electric light plant, which was recently destroyed by an explosion.

BERKELEY SPRINGS, W. VA.—James Lockhead & Company have been awarded the contract to erect an electric light station at Berkeley Springs.

SYRACUSE, N. Y.—The Electric Light and Power Company has filed with the Secretary of State a certificate of an increase of capital from $800,000 to $890,000.

ALAMEDA, CAL.—The city trustees will sell to the highest bidder a franchise for operating a plant for electric light and power in Alameda.

BUFFALO, N. Y.—The Buffalo Electric Light and Power Company has appointed George Urban, Jr., president, James A. Roberts, vice-president, and Henry Koons a committee with full power and authority to negotiate for the purchase of the Niagara Falls Brush Electric Light Company's plant. It is the intention of the Buffalo Company to erect at Niagara Falls an entirely new plant.

BORDENTOWN, N. J.—Mr. Wiley, of Moorestown, has been interviewing the members of the Bordentown city council relative to the privilege of erecting an electric light plant.

CLEVELAND, TENN.—A local syndicate has been granted a franchise to erect an electric light plant in Cleveland.

MCDONALD, PA.—The Citizens' Electric Heat, Light and Power Company has been incorporated with a capital of $12,000.

FORSYTH, GA.—Plans and specifications have been prepared for an electric light plant to be erected in Forsyth.

New Manufacturing Companies.

ST. PAUL, MINN.—The Western Electric Heating Company has been incorporated by Charles T. Johnston, Frederick P. Luther and Frederick P. Hager; capital, $1,000,000.

STAFFORD, CONN.—The Hyer-Sheehan Electric Motor Company has increased its capital from $2,500 to $3,000. J. M. Sheehan, of Stafford, and A. H. Havemeyer, of Newburg, N. Y., have been admitted as stockholders.

A New Reservoir Drawing Pen.

A very ingenious and sensible drawing pen has been put upon the market and there can be no doubt that it will fill that place which has been so often termed "a long-felt want." Anyone who has had much experience in heavy line work will realize what an improvement this device is over the regular drawing pen. It consists, as shown in the accompanying illustrations, of an ordinary hinged-nib drawing pen, provided with a hollow celluloid handle, into which fits a Cylinder, C, which is shown withdrawn from the handle in the lower illustration. The rod or plunger, P, serves to draw the India ink into the cylinder, C, while the tube T is provided to carry the ink to between the nibs of the pen; the whole reservoir attachment, as will be seen from the lower illustration, constituting in reality a miniature hand pump. It is manufactured by Jackson Brothers, 50 Call Lane, Leeds, England. Those who recognize the advantages of the "injector" will do well to provide themselves with one as soon as possible. It is clean, a labor-saving device, and is inexpensive.

FIG. 1.—IMPROVED DRAWING PEN.

FIG. 2.—CYLINDRICAL DRAWING PEN.

The Wilmot & Hobbs Manufacturing Company.

This well known Bridgeport, Conn., company have secured another large contract from the United States government for their cold rolled "Swedoh" steel, which is being used for some very severe stamped and drawn work that the government have been making for some time. This steel is something quite new for such work and after being submitted to some very severe competitive tests it has been demonstrated that it is very superior to anything heretofore used for this work. The company is making quite a specialty of this work.

To Estimate the Weight of Iron.

A simple way of determining the weight of sheet iron without putting it on the scales is thus described by the *Ironmonger:* It has been found by experience that a square foot of iron plate one-eighth of an inch thick weighed almost exactly five pounds, and this forms a basis for a very simple and easy rule. As a square foot of iron one-eighth of an inch thick weighs five pounds, a square foot of one-fourth inch iron will weigh 10 pounds, and therefore the area of any sheet iron (or plate iron) in square feet multiplied by the thickness in one-eighths and multiplied by five will give the approximate weight of the piece.

KINDRED INTERESTS

The Columbia Incandescent Lamp Company, of St. Louis, is in receipt of more orders than at any time during its history. These lamps are very popular, please the consumer, and consequently a large fall trade has set in.

The New York Engraving and Printing Company, 320 to 322 Pearl street, New York, have sent us some very pretty hand fans showing their artistic half-tone work. But we still maintain that the electric fan is the king of breeze makers for home or office.

The Tice-Lintner Electric Company, of Minneapolis, Minn., have sent us a new catalogue of their patented indicator, recently described in the REVIEW. This indicator is a good thing for lighting and electric railway plants, and will undoubtedly be in strong demand.

The Berlin Iron Bridge Company, of East Berlin, Conn., have received the contract for the new power station for the Atlantic Improvement Company, Astoria, L. I. There will be two buildings, a boiler house 62 feet wide and 85 feet long, with a dynamo room 70 feet wide and 130 feet long. The dynamo room is controlled by a traveling crane to be furnished by the same parties.

A. W. Harris Oil Company, of 110 and 111 South Water street, Providence, R. I., manufacturers of high grade lubricating oils for dynamo and other uses, have issued an artistic little catalogue descriptive of their wares. The business of this company has been so satisfactory that they have deemed it advisable to open an agency for the sale of their products in this city. Mr. H. G. Martin, 13 Park Row, has taken charge of this end of the business.

The Allgemeine Elektricitats-Gesellschaft, of Berlin, manufacturers of all kinds of electric generators, power transmission and transportation apparatus, have a very thorough and excellent exhibit in the Electricity Building at the World's Fair. They have published a little brochure containing illustrations of several features of their manufactures. Among these may be mentioned rotary current dynamos, electric cranes, switches and safety devices, electric launches and railway motors and central station power plants.

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ELECTRICAL PATENTS

INDEX OF INVENTIONS FOR WHICH LETTERS PATENTS OF THE UNITED STATES WERE ISSUED ON JULY 11, 1893.

501,049 Commutator connection; Norman C. Bassett, Lynn, Mass., assignor to the General Electric Co., New York, N. Y.

501,059 Regulator for dynamo-electric machines; Wm. H. Elkins, Cambridge, Mass., assignor to the Thomson-Houston Electric Co. of Connecticut.

501,060 Brush for dynamo-electric machines and motors; Jonathan P. B. Fiske, Lynn, Mass., assignor to the General Electric Co., Roston, Mass.

501,068 Electric snap switch; Caryl D. Haskins, Lynn, Mass., assignor to the General Electric Co., New York, N. Y.

501,071 Electric switch; Carl F. W. Hofer, Berlin, Germany, assignor to Siemens & Halske, same place.

501,074 Electric arc lamp; Josef Jergie, Vienna, Austria-Hungary.

591,080 501,081 Electric arc lamp; Georg Kirkegaard, Brooklyn, N. Y.

501,085 Telephone circuit and apparatus. 501,086 Station apparatus for telephone circuits; Sherwood J. Larned, Evanston, Ill., and Frank A. Pickernell, Newark, N. J., assignor to the American Telephone and Telegraph Co., of New York, N. Y.

501,087 Electric signaling; Thomas D. Lockwood, Melrose, Mass , and Sherwood J. Larned, Evanston, Ill., assignors to the American Telephone and Telegraph Co., of New York, N. Y.

501,095 Electric lighting system; Paul Nordmann, Berlin, Germany, assignor to Siemens & Halske, same place.

501,102 Telephone signaling apparatus and circuit; Frank A. Pickernell, Newark, N. J., assignor to the American Telephone and Telegraph Co., of New York.

501,114 Lightning arrester; Elihu Thomson, Lynn, Mass., assignor to the Thomson-Houston Electric Co. of Conn.

501,117 Dynamo electric machines; Harry L. Tyler, Corning, N. Y., assignor of two-thirds to John Magee and Louis P. Miller, same place.

501,121 Art of manufacturing chlorine or caustic alkali by electrolysis; Chas. N. Waite, Newton, Mass.

501,144 Ammeter; Wm. Hochhausen, Brooklyn, N. Y.

501,151 Electric battery; James H. Mason, Brooklyn, N. Y., assignor by mesne assignments to the Mason Electric Co., East Orange, N. J.

501,168 Telephone switch. 501,169 Telephone exchange apparatus. 501,170 Duplex electric arc lamp; Chas. E. Scribner, Chicago, Ill., assignor to the Western Electric Co., same place.

501,172 Manufacture of incandescent electric lamps; Elihu Thomson, Swampscott, Mass., assignor to the Thomson-Houston Electric Co. of Connecticut.

501,173 Electric switch; Frederick A. Thum, Newark, N. J.

501,183 Electric signaling circuit; Wm. Daves, Jersey City, N. J., assignor to the Hall Signal Co., of Maine.

501,191 Switch for electric conductors; Olaf Offrell, Middletown, Conn., assignor to the Schuyler Electric Co. of Connecticut.

501,198 Commutator brush holder; Alton J. Shaw, Muskegon, Mich.

501,194 Revolving armature for electric machines. 501,195 Electric locomotive; Elmer A. Sperry, Chicago, Ill., assignor to the, Sperry Electric Railway Co., Cleveland, O.

501,201 Automatic circuit interrupter: Alexander Wurts, Pittsburgh, Pa., assignor to the Westinghouse Electric and Manufacturing Co., same place.

501,205 Socket for incandescent lamps; Axel Ekstrom, Lynn, Mass., assignors to the Thomson-Houston Electric Co. of Connecticut.

501,206 Electric contact apparatus; Jonathan P. B. Fiske, Lynn, Mass., assignor to the Thomson-Houston Electric Co. of Connecticut.

501,241 Lightning arrester; James E. Browne, Elizabeth, N. J.

501,245 Electric locomotive; Wm. E. C. Eustis, Milton, Mass.

501,258 Electric circuit-closing device; William Sears, Boston, Mass.

501,270 Letter box; Peter Fitzgerald, Hyde Park, Mass.

501,291 Electric time switch; James F. McLaughlin, Philadelphia, Pa.

501,292 Electric bell; Wilson J. Newman, Brooklyn, N. Y., assignor to Henry E. Baxter and Channing Baxter, same place.

501,294 Fender for electric cable, or other similar cars; Wm. J. Nunn, Hyde Park, Mass.

501,306 Electric alarm money drawer; Wm. J. Walker and Alexander L. Bedford, St. Louis, Mo.

501,307 Railway signal; James Wayland, Newark, N. J.

501,309 Method of regulating dynamo electric machines; Merle J. Wightman and Herman Lemp, Hartford, Conn., assignors to the Schuyler Electric Co. of Connecticut.

501,376 Armature; Joseph J. Smith and George W. Findlater, Jamaica, N. Y.

501,388 Mechanical telephone; Edwin W. Warren, Tyring, Mass.

501,405 Support for telephonic receivers; Norval L. Burchell and Burnet L. Nevins, Jr., Washington, D. C.

501,450 Electric switch; Lucius T. Stanley, Brooklyn, N. Y., assignor to the Cutter Electrical and Manufacturing Co., Philadelphia, Pa.

501,472 Station apparatus for telephonic and telegraphic circuits, Theodore Spencer, Cambridge, Mass.

501,481 Trolley wire hanger; Alexander W. Meston, St. Louis, Mo.

501,482 Revolving motor; Herbert L. Parker and Alexander W. Meston, St. Louis, Mo.

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